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THE IMPACT OF ORGANISATIONAL CULTURE AND MAINTENANCE STRATEGIES IN ORGANISATIONAL BUSINESS PROCESSES

When the financial prospects of the economy are limited, the emphasis is more explicitly placed on the preservation of the goods already possessed. This results in the increased importance of the role of maintenance. However, the undisturbed operation of a corporation's business procedures is not only important when the corporation's sources are limited due to the troublesome economic situation, but also in the periods of prosperity. Failures occur in every organisation's business processes, including those that are the best organised. Depending on activity profile, size and environment of the organisation, failures have different effects in the business process system. Note that due to the strengthening economic competition, the reliable corporation operations are more and more important. For example, in the automobile industry a few hours of breakdown could cost a fortune. According to Handy, it is becoming a trend that large and medium-sized enterprises – so called "elephants" – are served by small companies ("fleas") and formed into chains *(Handy, 2003)*. The question is what kind of behaviour the "elephants" should choose if they wish to organize their own processes and supply chain that consists of the "fleas" in a reliable way. The aim of this paper is to identify the relations of maintenance strategies of business processes in a procurer-supplier relationship of organisations. Further, the aim is to identify the relations between the corporate culture and the failures occurring in the business processes of an organisation. The paper expansively presents and evaluates the other technical and management related papers dealing with reliability, maintenance, and organisational culture. The focus is on the presentation of the different kind of failure modes. The empirical research is based on a questionnaire-survey; the data is collected from a large sample with the involvement of corporations operating in Hungary. The statements of the research are analysed by using statistical and econometric quantitative methods. Through the research results, the relations between the maintenance strategies of the procurer and the supplier organisations are revealed. Also, the relations between corporate culture and failures occurring in business processes are presented.

Theoretical background of the research

In close relationship to the research, five major phenomena should be described precisely with the aim of understanding the research focus and results. Thus the important definition of business process, reliability, failure,

maintenance strategy and organisational culture should be given in the first section of the paper.

The reliability aspects of business processes are widely described by Jónás *(Jónás-Kövesi, 2009; Jónás, 2010a,b; Jónás, 2011)*. Jónás extends the interpretation of reliability to business processes. In this context, reliability is not only related to machines, equipment, or different kinds of products, but business processes as well. Based on the definition by Jónás, business process is *"an umbrella term, which could mean different processes in relationship with the organisational operation in a broader sense" (Jónás, 2010b)*. Thus reliability of the business processes of the human resources department can be measured quite similar to the production equipment facilities. The only difference can be described in the measurement methods.

Definition, meaning, development and composition of reliability all have wide interpretations among many publications and standards *(Gnyegyenko et al., 1970; IEC 50(191):1990; Gaál-Kovács, 2002; Bazovsky, 2004; Kövesi, 2011; Smith, 2011; O'Conor-Kleyner, 2012)*. The definition of reliability is still developing. The appearance of newer technologies is leading scholars to rethink and redefine reliability. In the beginning, reliability was "working without flaws", but since that time this explanation has went through some major transformations. *(Mobley et al., 2008)*. Due to all these the definition of reliability should be given using a source. The source should probably include the most citations present in international literature on reliability. The application of the IEC (50)191:1990 standard widely appears in the international literature. There is a focus on reliability and maintenance in different research fields as well *(Catelani-Gori, 1996; Rausand, 1998; Gaál-Kovács, 2002; Pakanen-Sundquist, 2003; Kövesi, 2011)*. Meulen and Koorneef recommend IEC (50)191:1990 standard for interpreting reliability *(Meulen-Koornneef, 2002)*. Leger and his colleagues describe reliability in close relationship with IEC (50)191:1990 standard *(Leger et al., 1999)*. Due to the conceptual scope of detection of different failure modes, it is highly advised to base definitions using this standard *(Catelani-Giraldi, 1999; Catelani-Fort, 2000)*. Besides, some researchers connected reliability directly to the IEC (50)191:1990 standard *(Vatn et al., 1996; Hokstad, 1997)*.

Throughout the research dependability is defined by the IEC (50)191:1990 standard. Based on this definition, reliability (in general) is *"the collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance and maintenance support performance" (IEC 50(191):1990)*. By the standard, the definition of availability is *"the ability of an item to be in a state to perform a required*

function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided" *(IEC 50(191):1990)*. This ability depends on the combined aspects of the reliability performance the maintainability performance and the maintenance support performance. These definitions should also be provided. Reliability performance is *"the ability of an item to perform a required function under given conditions for a given time interval" (IEC 50(191):1990)*. Maintainability performance is *"the ability of an item under given conditions to use, to be retained in, or restored to, a state in which it can perform a required function, when maintenance is performed under given conditions and using stated procedures and resources" (IEC 50(191):1990)*. Maintenance support performance is *"the ability of a maintenance organisation, under given conditions, to provide upon demand, the resources required to maintain an item, under a given maintenance policy" (IEC 50(191):1990)*. In a narrower sense, durability and reliability are considered to be the same concept. Figure 1 shows the relevant relationships between the previously described definitions.
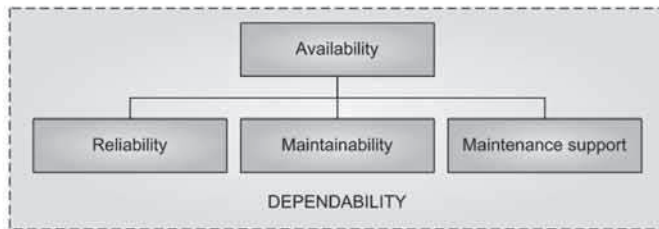

Figure 1. Dependability as a collective term
Source: *IEC 50(191):1990*

In understanding the possible failures of a business process, first the meaning of failure should be defined based on the previously applied standard. According to the standard, failure is defined as "the termination of the ability of an item to perform a required function" *(IEC 50(191):1990)*. It should be noted that after failure, the item has a fault, and "failure" is an event as distinguished from "fault", which is a state. Figure 2 clearly shows the relationship between failure and fault presented by Rausand and Oien. *(Rausand-Oien, 1996)*.
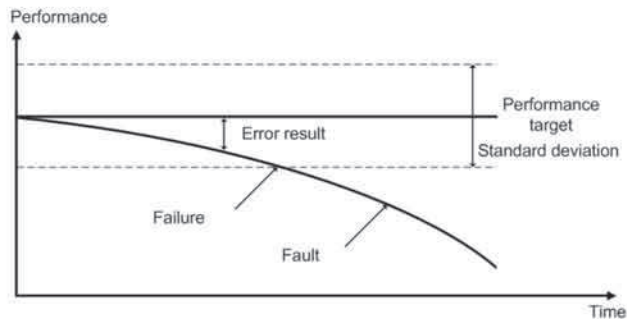
Figure 2. Relationship between failure and fault
Source: *Rausand-Oien, 1996*

In this context performance error results are not a failure until it gets hold of the lower limit of standard deviation. Under the lower limit of standard deviation, the item or process is in fault state. The other theoretical concepts of failure are widely described by several publications as well *(Balogh et al., 1980; Davidson, 1988; Gaál-Kovács, 2002; Narayan, 2004; Daley, 2008)*.

The rest of the publications related to reliability and failures suggest describing the nature of different failures using the IEC (50)191:1990 standard *(Catelani-Gori, 1996;*   *Rausand, 1998;*   *Pakanen-Sundquist, 2003; Del Frate et al., 2011)*. According to these recommendations, definitions of different failures and faults are also originated from this standard. This distinguishes many failures from each other. The most important ones from the point of this research are "critical", "non-critical", "misuse", "mishandling", "weakness", "design", "manufacturing", "ageing", "sudden", "drift", "catastrophic", "complete", "major", etc. failure or fault.

The phenomenon of reliability and maintenance "go hand in hand". It is also generally accepted that maintenance is a service activity and the recent decades have increased its relative importance *(Lewitt, 1997; Moubray, 1997; DIN 31051:2003-06;*   *Karen et al., 2003;*   *Szántó, 2003, 2008; Wireman, 2008a,b)*. According to numerous authors, nowadays many new objectives are related to the maintenance phenomenon. For instance, increase in productivity, JIT support, quality product development, environmental conservation and overall plant efficiency support *(Riis et al., 1997; McKone-Elliott, 1998; Al-Najjar, 2000; Leite da Silva et al., 2004)*. Just in the case of reliability, there are several definitions of maintenance applied in different publications. The purpose of these definitions has changed so much in time related to the development of the phenomenon *(Szabó, 1975; Rapatyi, 1976;*

Stanley-Howard, 1978; Lewitt, 1997, 2009;, Kovács, 2001;, Gaál-Kovács, 2002, Wireman, 2008a). According to Kovács, maintenance is the supporter of business processes. Thus one possible definition: maintenance is the sum of activities connected to a corporations' physical wealth that allows the successful completion of business processes *(Kovács, 2001)*. Moral wealth can be associated to Kovács's definition. Moral values (such as "good-will") contribute to the success of business processes as well *(Bognár-Gaál, 2011)*. The IEC (50)191:1990 standard defines maintenance as *"the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function" (IEC 50(191):1990)*.

As the phenomenon of maintenance has lots of definitions maintenance strategy can also be defined in many ways. It is generally accepted in the scientific literature that two major groups of maintenance strategies (reactive and proactive) can be described *(Kelly, 1997; Wireman, 2004, 2008b; Wang et al., 2007; Boschian et al., 2009; Cheng-Tsao, 2010)*. In the research maintenance strategy is defined by following the definition of Gaál and Kovács.

Thus maintenance-organization from the point of reliability theory approach must be based on the consideration of risks (technological, economical and human). Thus maintenance strategy belongs to the category of a leaders' decision. The idea of maintenance strategy should be defined on a decision-theory basis. Therefore, maintenance strategy is the chain of decisions made in order to reach a given goal *(Gaál-Kovács, 2002)*. The possible ways of maintenance strategy development are synthesized in many publications. Figure 3 represents one of these. Based on Dunn's work, Gaál states that different trends and conceptual scopes are widely related to each other. Thus in different comparisons it could be quite difficult to discuss them as individual phenomena *(Gaál, 2007)*.

According to Kovács four possible maintenance strategies can be described *(Kovács, 2003)*:

- Breakdown strategy (BDS) (The starting point of the decision chain is breakdown.)
- Time-based strategy (TBS) (The basis of the decision chain is a prescheduled repair strategy that can be developed in solid or flexible system as well.)
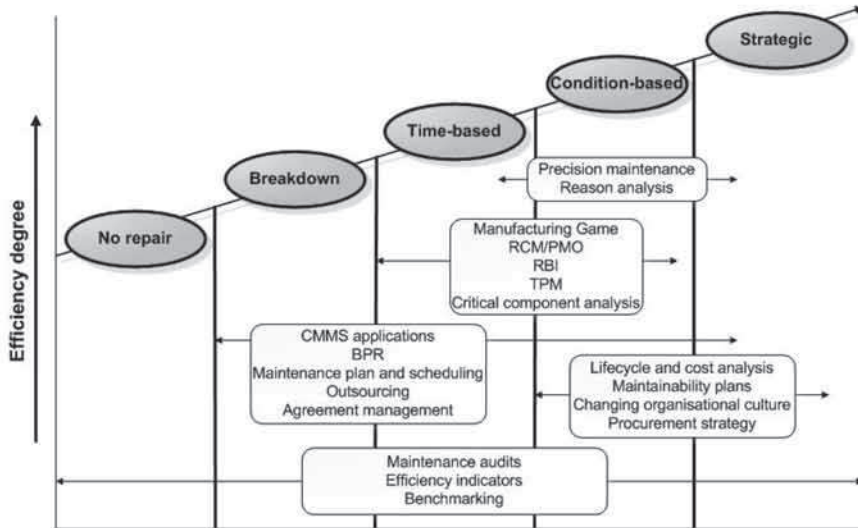
Figure 3. Different trends and conceptual scopes of maintenance management
Source: *Gaál, 2007*

- Condition-based strategy (CBS) (The basis of the decision chain is observation, measurement evaluation and a comparison of these with the desired state.)
- Maintenance prevention strategy (MPS) (This strategy recognizes the importance of reliability, maintenance and the economic efficiency at the design phase. In order to avoid breakdown teamwork, continual perfecting, involvement and authorization of employees are applied.)

Breakdown maintenance strategy waits for breakdown to occur while the other three are preventive maintenance strategies. Breakdown strategy is the least developed and maintenance prevention strategy is the most developed. In the case of an organisation, these four strategies can be used in parallel. This is because there are machines and processes that require only breakdown maintenance while others work better with one of the preventive strategies. Therefore, a selective strategy can be developed. The applicable strategy depends on the risk taken in case of breakdown.

Since the '70s, organisational scholars have been paying serious attention to the concept of organisational culture *(Kluckhohn-Strodtbeck, 1961; Hall, 1976, 1990; Hofstede, 1980, 2001; Trompenaars-Hampden-Turner, 1998).*

The relationship between organisational culture and maintenance has already been described. *(Thomas, 2005)*. Thomas represents organisational culture in his book as a "soft", phenomenon. This definitely can affect "tough" phenomena just like reliability of technological processes and maintenance systems. Until now, the number of different kind of culture definitions is well above 150 *(Kroeber-Kluckhohn, 1978)*. A generally accepted culture definition is that described by Schein who defines culture as the way of problem solving by different human groups *(Schein, 1985)*. Culture usually can be examined through a variety of points of view. Therefore many relevant dimensions, levels and contexts are revealed in the scientific literature *(Bergler, 1993; Borgulya, 2001; House et al., 2004; Kovács, 2006; Migliore, 2011)*. In synthesizing these findings, Karahanna along with other authors developed a general model. In this model which the relevant levels of culture can be easily described *(Karahanna et al., 2005)*. Figure 4 shows the relationship between the six levels of culture.

In this research, the main focus is on the level of organisational culture. Research scholars agree that the role of organisational culture is a key factor in the life of the organisation. It has a significant effect on the organisational processes *(Cameron-Quinn, 2006; Alvesson-Sveningson, 2008; Capon, 2009; Gregory et al., 2009; Jones, 2010; Senior-Swailes, 2010)*. Numerous models and typologies are described in the field of organisational culture that can help in understanding the specialities of this phenomenon *(Kono, 1990; Hofstede, 1991; Handy, 1993; Morgan, 1996; Trompenaars-Hampden-Turner, 2002; Cameron-Quinn, 2006)*. Some of these models and typologies (Kono's, Handy's, Morgan's) appear only on the pages of different textbooks. Still these works are significantly valuable ones. Present researchers seem to cite these models as only generally important and basic theoretical models. The much more active research trend focuses on the model of Hofstede, Trompenars and Hampden-Turner as well as Cameron and Quinn. In the research, the Competing Values Framework (CVF) originated to Cameron and Quinn is applied. CVF was originally developed measuring and changing organisational culture (up against Hofstede's model) and the evaluation of CVF is clearly independent (up against the model of Trompenaars and Hampden-Turner). CVF started in the '80s and after a long development period it gained its present form *(Quinn-Rohrbaugh, 1981, 1983; Cameron, 1986; Quinn-Cameron, 1988; Cameron-Freeman, 1991; Quinn-Spreitzer, 1991; Cameron, 1997; Cameron-Quinn, 2006)*.
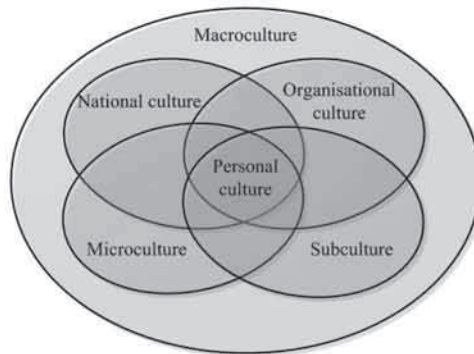
Figure 4. The relationship between the six levels of culture
Source: *Karahanna et al., 2005*

As Figure 5 shows, CVF has two dimensions that form four quadrants. Each represents a distinct set of organisational effectiveness indicators. The first dimension is "flexibility and discretion" versus "stability and control". The other is "internal focus and integration" versus "external focus and differentiation" *(Cameron-Quinn, 2006)*.

As it can be seen on Figure 5, each quadrant has a name that distinguishes its most notable characteristics: Clan, Adhocracy, Hierarchy and Market. The orientation of an organisation with clan culture is collaborative. The leaders belong to the facilitator, mentor or team-builder type. The organisation values are commitment, communication and human development. The basic theory for success is that human development and participation produces effectiveness. Organisations with adhocracy culture tend to orientate toward creative solutions. The leader exemplifies innovation, entrepreneurship and encourages visionary behaviour. Values are innovative outputs, transformation and agility. According to this culture type, the best way to increase effectiveness is through innovation, vision and new resources. The basic concept of hierarchical organisations is controlling. The leaders' main roles are coordinating, monitoring and organizing. Main values are efficiency, timeliness, consistency and uniformity. Hierarchical organisations believe that control and efficiency with capable processes produce effectiveness. The market culture type believes in competition. Managers belong to the hard driver, competitor and producer type. These organisation values are market share, global achievements and profitability. In this context, aggressive competition and customer focus produces effectiveness *(Cameron-Quinn, 2006)*.

Figure 5. The Competing Values Framework (CVF)
Source: *Cameron-Quinn, 2006*

Nowadays, CVF is usually part of different studies that are related to organisational culture in the domestic private sector *(Balogh et al., 2010; Bognár, 2010; Balogh, 2011; Balogh et al., 2011a,b; Fekete, 2010, 2011; Gaál-Fekete, 2011; Gaál et al., 2010, 2013)*. Several other researchers confirm that CVF is an appropriate tool in measuring organisational culture in relationship with other variables. This is similar to ethical codes, managerial roles and effectiveness of IT systems *(Cooper-Quinn, 1993; Dipadova-Faerman, 1993; Hooijberg-Petrock, 1993; Stevens, 1996; Gardner et al:, 2009)*. CVF is widely applied to different operational areas like higher education and health care *(Smart-Hamm, 1993; Smart-St. John, 1996; Scott et al., 2003; Hartmann et al., 2009)*. Using CVF, Ralston compared the organisational culture of several Chinese organisations. Nummelin examined several Finnish organisations in the field of building industry and Vijayalakshmi examined the organisational culture of different kinds of banks in India *(Nummelin, 2006; Ralston et al., 2006; Vijayalakshmi et al., 2009)*.

Research focus and significance

Even in the best performing organisations there can be confusion and malfunction in the operation of the organisation's business processes. Different types of consequences can occur depending upon the organisation's business

profile, size and working environment. If the business process failures occur, it
follows logically that different maintenance strategies can be utilized. There are
different reasons for failure and often several subsequent maintenance strategies.
These create a special maintenance strategy system on the organisational level.
Some organisations maintain their most important business processes when the
failure occurs; others check the operable minor business processes in order to
avoid slight disturbances.

The examination of the reliability of organisational business processes is
specifically a novel field. Domestic research results are fundamentally related to
the work of Jónás, whereas other researches examine maintenance strategies in
close relationship with business strategies *(Pinjala, et al, 2006; Jónás, 2011)*.
Business processes ensuring organisational operation are most transparent for
the leader of the organisation, both as a whole and separately, and it is also true
in the context of organisational culture, the nature of which is frequently
connected with most organisational characteristics. In his book, Thomas
presents how maintenance and organisational culture are interwoven *(Thomas,
2005)*, while other authors find the knowledge of organisational culture vital in
relationship with maintenance activities *(Reiman-Oedewald, 2004)*. In certain
industrial branches reliability, maintenance and safety are so highly required for
the operation of organisational business processes that a new form of culture,
namely "safety culture", has evolved.

A key motive of the research is the analysis of the maintenance strategies of
organisational processes. A second motive is the examination of the relationship
between business processing failures and organisational culture. Hungary is a
small open economy in this gradually globalizing world. The most significant
economic organisations in Hungary are dominant mainly in the Eastern
European region. In terms of worldwide economics, their significance is rather
negligible. Domestic companies are principally suppliers of other (not
necessarily foreign) organisations. This results in significant dependency in
terms of the present day's economic conditional system. For an organisation to
keep a supplier role or to join the supplying system, it is necessary to make
efforts that often depend upon the procurer's regulations. The economic
environment predictability on a global level has moved in an unreliable direction
during the past few years. This has brought serious challenges into life for
organisations. Procurer organisations have become more deeply interested in
'operating in a better way' and cooperating with 'good' suppliers. Whereas
suppliers must work really hard to keep their place. The research has been
carried out with the involvement of CEOs of economic organisations operating

in Hungary. The practical approach objective is to provide help for organisations in Hungary with the operation of their business processes in a 'better' way.

The research seeks answers to the following questions:

1. Is there a traceable relationship between the system of business process maintenance strategies of procurer and supplier organisations?
2. Does the knowledge of the maintenance strategies applied to maintain procurer organisational maintenance decrease the uncertainty concerning maintenance strategies applied to supplier business processes?
3. Is it possible to trace difference in relation to failures occurring in organisational business processes in case of organisations belonging to different organisational culture types?

Research hypothesis and research model

Research hypotheses are phrased that refer to the presumed relationships of the variables present in the research model. In the research, maintenance strategies are interpreted as two different strategy types. One is that maintenance strategies of the procurer applied for their own business procedures. The second is expected for the suppliers' business procedures. The maintenance strategies of the procurer are considered to be the independent variables. In contrast, the ones expected by the procurers from the suppliers are considered to be the dependent ones. In addition to these, the organisational culture is considered to be the independent and the failure type of business process is the dependent variable.

Hypothesis 1
There is a relationship between the maintenance strategy systems of the procurer and the supplier organisations' business processes.

Both in the case of the independent and the dependent variables, the four variables are the breakdown, the time-based, the condition-based based and the maintenance preventing strategy. On the basis of this hypothesis, it is supposed that there is a measureable relation between the procurer and the supplier part's maintenance strategy system.

Hypothesis 2
Knowing the maintenance strategies of the business procedures of the procurer organisation, we can draw conclusions concerning the maintenance strategies of the business procedures of the supplier organisation.

It is supposed that if on the procurer side, the organisation applies a given maintenance strategy system to maintain its own operation, then it acts likewise when it maintains the operation of the supplier organisation.

Hypothesis 3
Knowing the dominant corporate culture type of the organisation, a difference can be found between the average values of certain failure characteristics of corporate organisation.

The different corporate culture types influence the everyday life of an organisation. In the course of the research, corporate culture is considered an independent variable. The four culture types described by Cameron and Quinn are applied as a basis. Figure 6 represents the research model.
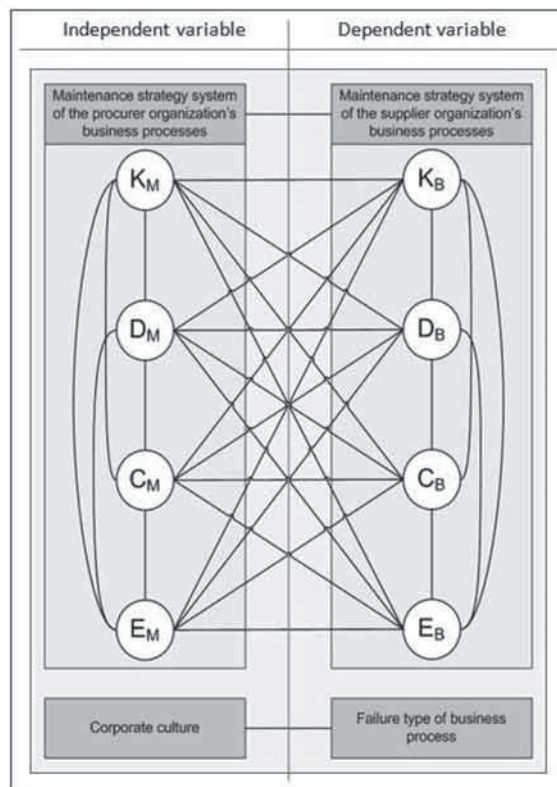

Figure 6. The research model
Source: *Bognár, 2013*

For testing of the first and second hypotheses, four variables are described in both the independent and the dependent sides of the model. These variables identify the four maintenance strategies applied in the research. The explanation of the notation is described below. Note that "M" in the lower index indicates the procurer's half and "B" indicates the supplier's part.

- E_M – breakdown maintenance strategy of the procurer organisation's business processes.
- C_M – time-based maintenance strategy of the procurer organisation's business processes.
- D_M – condition-based maintenance strategy of the procurer organisation's business processes.
- K_M – maintenance preventing strategy of the procurer organisation's business processes.
- E_B – breakdown maintenance strategy of the supplier organisation's business processes.
- C_B – time-based maintenance strategy of the supplier organisation's business processes.
- D_B – condition-based maintenance strategy of the supplier organisation's business processes.
- K_B - maintenance preventing strategy of the supplier organisation's business processes.

There are randomly drawn lines between the maintenance strategies in the model. These lines indicate the possible relationships between the maintenance strategies. The third hypothesis is illustrated in the bottom part of the research model. "Corporate culture" box includes the four culture types described by Cameron and Quinn. The box "Failure type of business process" indicates the possible failures occurred in the operation of business processes.

Applied methodology

In this section, it is presented how the concepts related to the research questions are made measureable in order to prove the pertinence of the research hypothesis. In the research, primarily the quantitative tools of social science methodology are used. At first, on the basis of the research model, the operationalising of the business processes' maintenance strategy system is carried out. It is important to mention that both in the case of dependent and

independent variables the maintenance strategy system of business processes is described according to the same pattern.

It is concluded that the maintenance strategy system should be measured based on the measured values and thus making the comparison of many organisational characteristics possible. The executive aspect should also be taken into consideration. Due to the above mentioned, the aim is to allow the leader of an organisation a panoramic view of the business processes' maintenance strategy system within the organisation. Accordingly, the four variables are interpreted as high level measurability variables. The goal of that is to make it possible for the measuring person to see to what extent each strategy is present in the maintenance strategy system of business processes. A short description and an example are provided for each strategy to the person involved in the analysis. To determine the maintenance strategy system of the business processes, the leader who carries out the measure is required to rate on a Likert-scale of 1-7 in four cases. The more dominantly a strategy is present, the higher score it receives and the less dominant it is, the lower score it receives.

To measure corporate culture as an independent variable, the Cameron-Quinn culture model and the Organisational Culture Assessment Instrument (OCAI) questionnaire are applied. In this section a brief overview of the measuring method of the OCAI questionnaire should be given. There are six dimensions on the basis of questionnaire measures that identify to which type of culture a corporation belongs (dominant characteristics, organisational leadership, management of employees, organisational glue, strategic emphases and criteria of success). The questionnaire connects each dimension to a statement. Each statement is related to one of the four types of corporate culture. Thus, in the case of each dimension there is a characteristic statement for all the four types of corporate culture in the questionnaire. Among these four statements, 100 points are to be distributed (in the case of each of the six dimensions). This depends to what extent the person who fills the paper out thinks a type of corporate culture is representative in the case of the given dimension. More points are awarded for a statement that better describes the representative values for a type of corporate culture in a given dimension. The 100 points is to be distributed completely according to the participant's own course, but more than 100 cannot be given.

For the analysis of failure reasons, CEOs were required to rate on a Likert-scale of 1-7 to what extent the failure of a business process can be originated from certain failure types. The bigger the number is, the stronger the relevance of the failure type is (1 if origination is not relevant, 7 if the origination is absolutely relevant).

To verify the hypotheses, the relevant methodological considerations to the evaluation are concluded from the nature of the certain variables. Also, they are concluded the results of previous theoretical researches. Regression and path analysis are applied for the evaluation of the first hypothesis. Cluster and crosstab analysis are used for the evaluation of the second hypothesis. Variance and post hoc analysis are applied for the evaluation of the third hypothesis.

General Background and Sample of Research

The research started in 2008 and was built on a quantitative survey. For data collection questionnaires were addressed to the CEOs of more than 2,700 companies in Hungary from different operational fields. More than 260 CEOs filled in the questionnaire. The data collection was carried out between 2009 and 2010. In the selection of target audience, the most important criteria was that CEO should have had an at least one-year work experience at the current organisation. This is because this period is necessary for sufficiently identifying the dominant company peculiarities. Considering the research focus, CEOs were the most relevant people in the company to answer the questionnaire. Only the CEOs had the right perspective to see through the entire business process system and the corporate culture. For measuring the internal consistency of the relevant variable groups of the questionnaire, Cronbach-alpha is an appropriate instrument. For each relevant variable group the Cronbach-alpha has higher than 0,7 value.
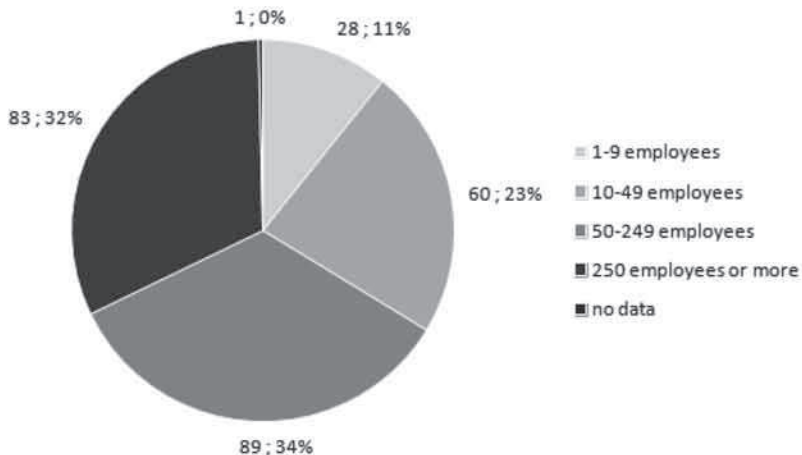

Figure 7. Distribution of companies by the number of employees
Source: *Bognár, 2013*

As Figure 7 shows, the sample is dominated by the medium and large sized companies. Small and micro-sized companies make up only one third of the whole sample.

Based on the data from the Hungarian Central Statistical Office, it is possible to determine the registered number of large and medium sized organisations in Hungary. 9,62% of the large and 1,68% of the medium sized organisations are represented in the research sample.

Figure 8 shows the distribution of the companies by the field of activity. The sample is dominated by the processing industry which contains companies from the automobile industry, electric industry, paper industry, process management industry, etc. The logistics and transportation field also has a significant part in the sample.
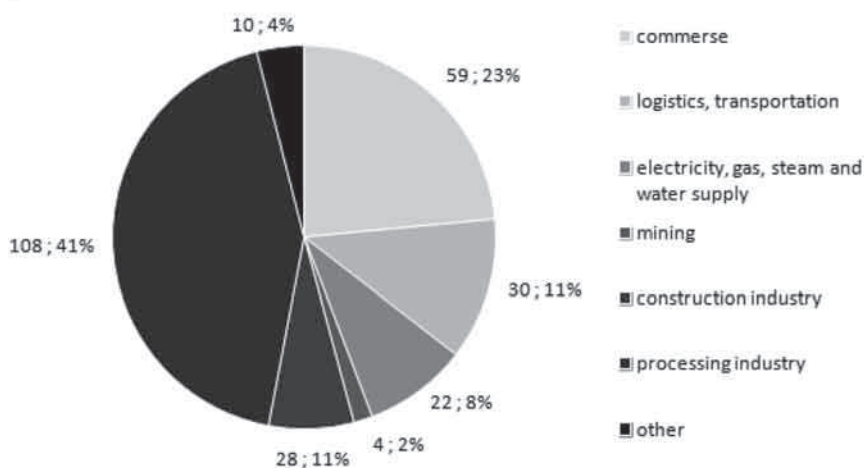

Figure 8. Distribution of companies by the field of activity
Source: *Bognár, 2013*

As it can be seen on Figure 9, the adhocracy culture type is significantly underrepresented in the sample. Based on the previous distribution diagrams, the cause of underrepresentation can be explained. Large and medium sized organisations have a significant proportion in the sample. In case of this organisational dimension, it is quite irrelevant that the organisation can have adhocracy culture type. On the other hand, the rest of the organisations are from operational fields where regulations and technological processes are strictly driven. Consequently, this is another disadvantage for adhocracy culture to gain a significant representation in the research sample.
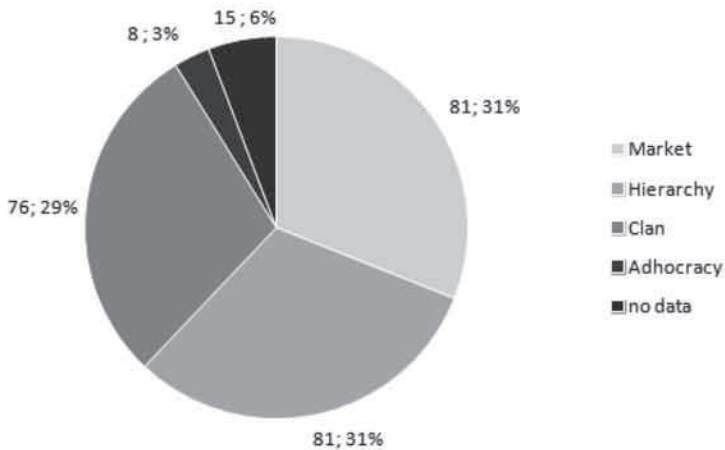
Figure 9. Distribution of companies by the dominant culture types
Source: *Bognár, 2013*

In light of this fact, those organisations which belong to the adhocracy culture type should be excluded from further tests related to the third hypothesis.

Research results

The results of the first hypothesis testing can be made visible as a path model which is built up by five linear regression models. All the prerequisites of each linear regression in the path model are realized. The value of the coefficient of determination (adjusted R^2) of each linear regression is high. The lowest value of the coefficient of determination is 0,237 and significant at 0,01 level, the highest is above 0,7 and also significant at 0,01 level. Figure 10 shows the developed path model.

Numbers over arrows indicate the value of the beta parameter of relationships. Numbers under arrows indicate the strength of correlations. One asterisk next to the number indicates that the value is significant at the 0,05 level, two asterisks indicate that the value is significant at the 0,01 level. The linear regressions are formally described below; while the coefficient of determinations are placed next to each linear regression:
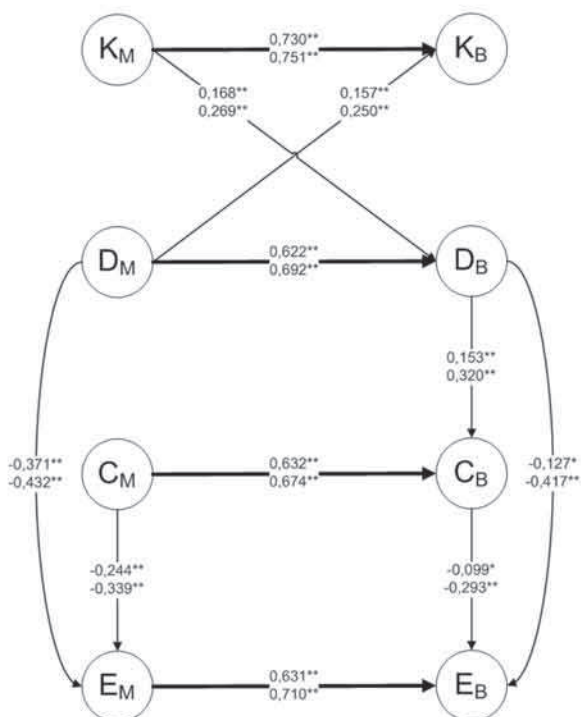
Figure 10. The five linear regressions in the path model
Source: *Bognár, 2013*

- $E_B = 0{,}631 * E_M - 0{,}127 * D_B - 0{,}099 * C_B + RESID_1$ Adj. $R^2 = 0{,}525$
- $C_B = 0{,}632 * C_M + 0{,}153 * D_B + RESID_2$ Adj. $R^2 = 0{,}470$
- $D_B = 0{,}622 * D_M + 0{,}168 * K_M + RESID_3$ Adj. $R^2 = 0{,}507$
- $K_B = 0{,}157 * D_M + 0{,}730 * K_M + RESID_4$ Adj. $R^2 = 0{,}584$
- $E_M = -0{,}244 * C_M - 0{,}371 * D_M + RESID_5$ Adj. $R^2 = 0{,}237$

The correlation analysis identified relationships between dependent and independent variables. In some cases relationships were weaker and had lower value of the coefficient of determination (as, for example, in the case of C_B-E_B). Meanwhile other cases were moderately strong and had medium-level of the coefficient of determination (e.g. in the case of D_M-E_M). Besides, the correlation between dependent and independent variables were positive in some cases (e.g. in the case of D_B-C_B) and negative in others (e.g. in the case of D_M-E_M). Negative correlations only occurred when their directions were vertical. By

studying these relations with negative correlation coefficients, it also can be discovered that these relations in all cases strive to "keep a distance" from breakdown maintenance strategy. In interpreting these results as a whole, the kind of structure appearing on the dependent variables' (the maintenance strategies of the procurer organisation) side cannot be definitely decided in the case of a given structure of independent variables (the maintenance strategies of the supplier organisation). One of the reasons is that methods applied in the case of dependent and independent variables of high level measurement scale are incapable of defining such statements. Though it can be presumed that the two sides are going to be similar, it cannot be methodologically precisely proven. It also can be stated that effects from the procurer side have a stronger influence on maintenance strategy than effects occurring in the variables of the supplier side. On this basis, it can be concluded that there is pressure on the suppliers by the procurer, which urges the suppliers to form their own maintenance strategies according to the demands of the procurer organisation.

By two fundamentally different methods of cluster analysis, the high level measurement scale variables of the procurer and the supplier organisations were transformed into low level measurement scale variables. Since negligible difference between the results of the two methods was noticed, it can be stated that the cluster model is robust and the created clusters correctly describe the real phenomena. Accordingly, on the basis of the maintenance of their business processes, the organisations can be divided in two basic theoretical clusters; breakdown maintenance appliers and preventive maintenance appliers. This result can be anticipated, since if these two groups exist in the case of machines, then they are likely to exist in the case of organisations as well. Even though in relation to business processes, it has yet to be proven. Table 1 shows the final cluster centres on procurers' and suppliers' side as well.

Organisation		Procurer		Supplier	
Cluster identification		I.	II.	I.	II.
Maintenance strategy	Breakdown	6	2	6	3
	Time-based	3	5	3	5
	Condition-based	3	5	3	5
	Maintenance prevention	3	4	3	4
Number of cases		148	109	132	122

Table 1. Cluster centres on procurers' and suppliers' side
Source: *Bognár, 2013*

The question to be answered is whether the awareness of maintenance strategies applied by the procurer organisation on their business processes

reduces the uncertainty concerning the maintenance strategies applied by the supplier organisation on their business processes. To provide the answer, crosstab analysis should be performed on the two clusters (breakdown and preventive strategy), as Table 2 shows.

		Supplier		Number of cases
		Breakdown maintenance	Preventive maintenance	
Procurer	Breakdown maintenance	117	29	146
	Preventive maintenance	15	93	108
Number of cases		132	122	254

Table 2. The basic table for crosstab analysis
Source: *Bognár, 2013*

After calculating the chi-square statistics, the statistics were significant on a level of 1%. Consequently, the two variables of the clusters are not independent of each other. To study the strength of the relationships the phi-coefficient, the Cramer V indicator, and the Lambda indicator should be calculated. Then the percentage should be defined in which identical cluster-pairs (breakdown-breakdown, preventive-preventive) occur on the explaining and explained sides. On the 1% level of significance, the value of the phi-coefficient was 0,656, which means that there is a strong relationship between the variables. Since the subject of the study is the 2x2 crosstab regarding the previously presented formulas, the value of the other symmetric indicator (Cramer V), is 0,656 as well. This also marks a strong relationship. The value of the Lambda indicator (asymmetric) is 0,593 on a level of 1% significance. This means that knowing to which cluster the procurer organisation's business processes belongs reduces uncertainty to the cluster membership of the supplier organisation's business processes by approximately 60%. From the crosstab, it can be concluded that if the maintenance of procurer organisation's business processes belongs to a given cluster, then in 83% of the cases the maintenance of supplier organisation's business processes will be in the same cluster. On the basis of all these, it can be concluded that there is a strong relationship between the maintenance of business processes of the procurer and the supplier organisations. Awareness of the characteristic features of the procurer organisation allows for accurate conclusions about the characteristics of the supplier organisation.

To study the phenomena occurring among the failures in the business processes and the corporate culture, variance analysis should be performed. To

identify corporate culture, the culture types of Cameron and Quinn were applied. To compose the characteristics of the failures the IEC (50)191:1990 standard was used. Variance analysis resulted three significant solution (Sig.< 0,05) from the aspect of corporate culture as an explaining variable. Table 3 shows the descriptive statistics of these cases.

		N	Mean	Standard deviation	Standard error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower bound	Upper bound		
misuse failure	Market	80	3,63	1,679	0,188	3,25	4,00	1	7
	Hierarchy	78	3,08	1,657	0,188	2,70	3,45	1	7
	Clan	74	2,82	1,456	0,169	2,49	3,16	1	6
	Total	232	3,19	1,632	0,107	2,97	3,40	1	7
manifacturing failure	Market	80	3,09	1,434	0,160	2,77	3,41	1	7
	Hierarchy	79	2,77	1,609	0,181	2,41	3,13	1	7
	Clan	74	2,50	1,274	0,148	2,20	2,80	1	6
	Total	233	2,79	1,462	0,096	2,61	2,98	1	7
major fault resulted	Market	80	3,50	1,669	0,187	3,13	3,87	1	7
	Hierarchy	78	2,97	1,554	0,176	2,62	3,32	1	6
	Clan	73	2,73	1,346	0,158	2,41	3,04	1	7
	Total	231	3,08	1,561	0,103	2,88	3,28	1	7

Table 3. Descriptive statistics of significant cases
Source: *Bognár, 2013*

It can be concluded that the clan culture type is the most resistant to different kinds of failures compared to the other two culture types. Market culture type is the least resistant. Besides, hierarchy culture type takes place in between the other two types in all of the cases. By post-hoc analysis, it can be pointed out that there is a significant difference between the average values of dependent variables. In parallel placement four different post-hoc tests (Bonferroni test, Sidak-test, Scheffé-test, Tukey-test) mostly the same results were given in each significant case. Table 4 shows it on the example of misuse failure.

It can be seen, that there is significant difference (Sig.<0,05) between the mean of Market and Clan culture types. It can be realised that there is no significant difference between the mean of Market and Hierarchy culture types. Further, there is no significant difference between the mean of Hierarchy and Clan culture types. Figure 11 represents the most important results of the variance and post-hoc analysis.

Dependent variable		Group 1	Group 2	Mean Difference (1-2)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Misuse failure	Bonferroni	Market	Hierarchy	0,548	0,255	0,098	-0,067	1,164
			Clan	0,801	0,259	0,007	0,177	1,425
		Hierarchy	Market	-0,548	0,255	0,098	-1,164	0,067
			Clan	0,253	0,260	0,998	-0,375	0,880
		Clan	Market	-0,801	0,259	0,007	-1,425	-0,177
			Hierarchy	-0,253	0,260	0,998	-0,880	0,375
	Sidak	Market	Hierarchy	0,548	0,255	0,095	-0,066	1,162
			Clan	0,801	0,259	0,007	0,178	1,423
		Hierarchy	Market	-0,548	0,255	0,095	-1,162	0,066
			Clan	0,253	0,260	0,703	-0,373	0,879
		Clan	Market	-0,801	0,259	0,007	-1,423	-0,178
			Hierarchy	-0,253	0,260	0,703	-0,879	0,373
	Scheffé	Market	Hierarchy	0,548	0,255	0,102	-0,081	1,177
			Clan	0,801	0,259	0,009	0,163	1,438
		Hierarchy	Market	-0,548	0,255	0,102	-1,177	0,081
			Clan	0,253	0,260	0,625	-0,389	0,894
		Clan	Market	-0,801	0,259	0,009	-1,438	-0,163
			Hierarchy	-0,253	0,260	0,625	-0,894	0,389
	Tukey	Market	Hierarchy	0,548	0,255	0,083	-0,054	1,150
			Clan	0,801	0,259	0,006	0,190	1,411
		Hierarchy	Market	-0,548	0,255	0,083	-1,150	0,054
			Clan	0,253	0,260	0,596	-0,361	0,867
		Clan	Market	-0,801	0,259	0,006	-1,411	-0,190
			Hierarchy	-0,253	0,260	0,596	-0,867	0,361

Table 4. Results of post-hoc analyses on the example of misuse failure
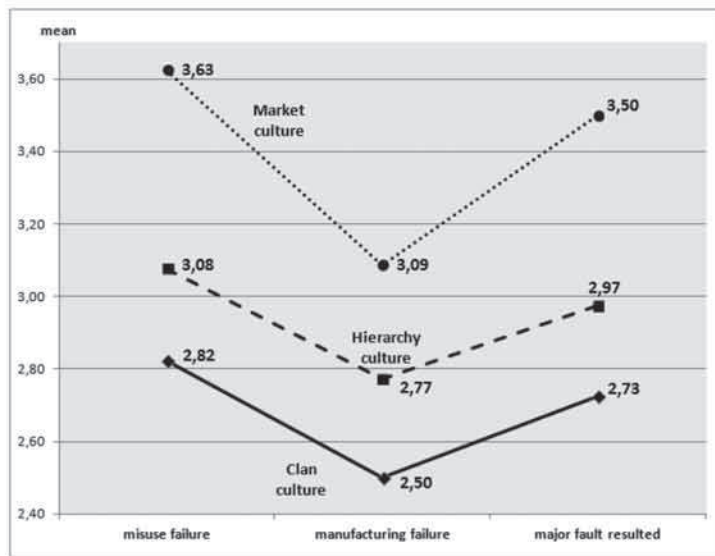Source: *Bognár, 2013*

Figure 11. Results of the variance and post-hoc analysis
Source: *Bognár, 2013*

Figure 11 shows that clan culture type has the minimal mean values in relationship with all the significant failures, as well as, market culture type has the maximum mean values. Hierarchy culture type lies between clan and market culture in each case.

Discussion

The elements of maintenance strategy system were determined. Different kinds of relations were identified between the maintenance strategy systems of the procurer and the supplier organisation's business processes. As the result of the research, it can be concluded that if the maintenance strategy of business processes of the procurer organisation is known, conclusions can be drawn concerning the maintenance strategy of business processes of the supplier organisation. It became clear that if the procurer organisation maintains its business processes according to a given maintenance strategy, then the maintenance of the business processes of the supplier organisation is most likely to be carried out the same way. On the basis of this result, practical kind of suggestions can be drawn up. As a conclusion of this result, maintenance strategies can be defined as a phenomenon describing relations of organisations in business life. This is a determining factor from the aspect of the novelty of the results presented in this paper.

Differences can be found in failures occurring in business processes of organisations belonging to a certain type of corporate culture are defined in this paper. In the case of clan and market culture organisations, there is a difference in the average values of the numerous failure characteristics of these organisations' business processes. There is a difference in the case of the following dependent variables: "misuse failure"; "manufacturing failure"; and "major fault". On the basis of this result, suggestions can be composed to practicing experts related to the changes in the corporate culture that could help to reduce the number of failure occurrences in their business processes. An order of corporate culture types can be established according to which type is the most resistant. This is based on the average values of all failure characteristics occurring in business processes. This result can only be seen visually in an appropriate way.

Responses to research questions

Is there a traceable relationship between the system of business process maintenance strategies of procurer and supplier organisations?

Based on the research results, the answer is yes. By the creation of a path model, it can be proved that there are significant relations between the dependent and independent variables of the model. Herein, relations between the maintenance strategies of equal levels of development are stronger and have higher value of coefficient of determination. Between the maintenance strategies of different levels of development, the relations have lower value of Pearson correlation and coefficient of determination.

Does the knowledge of the maintenance strategies applied to maintain procurer organisational maintenance decrease the uncertainty concerning maintenance strategies applied to supplier business processes?

Based on the research results, the answer is yes. On the basis of the maintenance strategies of their business processes, organisations that filled the questionnaire can be divided into two groups by cluster analysis. Breakdown maintenance strategy is typical in one of the groups and preventive maintenance strategy is typical in the other. The knowledge of which cluster the business processes of the procurer organisation belongs reduces the uncertainty on the cluster membership of the supplier organisation by 59,3%.

Is it possible to trace difference in relation to failures occurring in organisation business processes in case of organisations belonging to different organisational culture types?

According to the research results the answer is yes. Differences can be identified in the average values in three cases. These three cases are "misuse failure", "manufacturing failure" and "failure causing major fault". Clan culture type is the least sensitive to all kinds of failures and their effects. The market culture type is the most sensitive to them. Hierarchy culture type is in between the other two culture types in all of the cases. There is significant difference between the average values of the presented variables in the cases of clan and market culture types.

Practical applications of the research results

The vast majority of Hungarian organisations are usually the suppliers of other organisations. This phenomenon is enhanced by the globalised world economy. In this economy, an organisation can more easily become the supplier of another than local economic networks were only available. Of course, this not

only means advantages, but disadvantages as well. There is an increased number of possibilities but the demands concerning the present and planned positions are higher. In many cases, the differences rooted in the cultures of organisations can cause problems in an inter-organisational cooperation.

The paper helps the Hungarian organisations to determine the behavioural roles that should be followed in order to become the supplier of another organisation, or to be able to keep a given position. The maintenance aspect concerning business processes can be applied to handle the possible confrontational basis of many organisations and departments within the same organisation. The CEO of an organisation is one of the main contacts between the organisation and other organisations in the area. If the executive keeps his or her eyes open, and is able to identify the practices of his or her procurers, cooperation is going to be easier. For the executive of an organisation, knowing how his or her business partners manage their business processes means a great advantage over the possible competitor when it comes to keeping or gaining a position. The knowledge of the dominant maintenance strategy of a procurer organisation's business processes is very advantageous for the supplier. If the supplier is able to create a similar system, fewer confrontations can be expected with the procurer. In certain industrial branches, there are regulations that prescribe the requirements an organisation needs to meet in order to play an active role in the given industrial branch. This is only necessary, though, to enter the market. To run an efficient operation, it is not enough to be suitable for the prescriptions and simply meet the requirements. A more specific knowledge is needed for the chief executive officer of an organisation. Many organisations may find it useful to take this into consideration.

One of the most characteristic definitions of corporate culture is related to Marvin Bower. According to him, corporate culture is "how we do our work here". This definition is broad enough to be interpreted only from a complex executive overview, but this is its big advantage as well. Based on the results of this paper it can be recommended for the leaders of Hungarian organisations to deal with the inspection of the corporate culture of their organisations. Through following the recommendations, they can be more resistant to failures occurring in business processes as well.

If leaders often notice symptoms that derive from the inappropriate performance of the workers duties, they should try to shift the corporate culture towards the clan culture type. The same suggestion can be made in the case of regular changes in the structure of the organisation. The plans for the change might look good on paper, but the actual realisation of these plans may be

distracted by many influencing factors on the workers. If the business processes' system is often reformed, then, on the basis of the research results, the reforming of the corporate culture towards the clan type can be recommended for the CEO. Strengthening the clan type's attributes also can be suggested. This is applicable if the problems occurring in the system of business processes affect an important function of organisational operation especially if that causes problems in a business process of great importance.

The questionnaire developed in the research process may be able to perform complete organisational mapping. As a result, the complete cultural map of the organisation can be revealed and the hardships that each department is struggling with could be specified. Thus, reforming the given subculture may result in a shift towards the theoretical optimum of corporate operation on the level of the whole system.

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