THE ROLE OF ORGANISATIONAL CULTURE IN THE EARLY PHASES OF THE INNOVATION PROCESS

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ABSTRACT

This paper presents the results of an empirical study examining the role of organisational culture in the early phases of the innovation process - the so-called Fuzzy Front End (FFE). First, the theoretical framework and the cultural model which were used will be discussed. Second, success measures for the front-end will be developed as well as the hypothetical relation between organisational culture and success. This conceptual model has been tested in an empirical study which supports the hypothesis that an external oriented and organic culture promotes front-end success.

INTRODUCTION

The early phases of the innovation process gained much attention in academia as well as in industry. After the product development process (from product concept to market introduction) has been fine-tuned and stage-gate processes became a common standard, the attention shifted to the phases before. Here both industry experts and researchers identified great room for improvement. The question raised by Cooper and other experts in the New Product Development (NPD) field is no longer "How do we get the best ideas to the market?", but "Where do we get the best ideas from?" (Cooper, 1988; Cooper, 2001; Cooper and Kleinschmidt, 1986; Nobelius and Trygg, 1998). This paper contributes to the improvement of these early phases.

Why is the Front End so important?

During the last years much research has been done in the NPD field, especially its process optimisation (Griffin, 1997; Khurana/Rosenthal, 1997). These efforts tend to result in greater efficiency in the NPD process but the success/failure rate has not changed much on average over the past years (Griffin, 1997; Adams-Bigelow, 2004). After significant improvements till the mid 90ies the mortality curve has not improved and has been staying at high levels that leave room for improvement. Which means, that the research efforts of the last years about optimizing the NPD process did not yield in the intended results. Current research helps companies to become more efficient and develop products faster and at lower costs, however, the core problem of effectiveness seems not fully addressed, yet. The question to answer is: "How can we find the right problem to work on?" This question needs to be answered before the product development starts - during the so-called "Fuzzy Front End" (FFE). The importance of the FFE has been recognized by Cooper (1988). One of the top critical
success factors in product innovation according to Cooper is “more predevelopment work – the homework – must be done before product development gets under way. [...] sharp and early product and project definition is one of the key differences between winning and losing at new products”. Consequently Cooper adds in the newest editions of his book “the discovery stage: Ideation” which is “so important [...] that I now treat this as a separate stage. In previous editions of this book, the idea stage was treated as a given; it was always assumed that there were lots of ideas sitting around waiting to be worked on. Perhaps this is true, but the quality of these ideas is lacking in too many firms, and so the development pipeline is filled with mediocre, low-value projects.” Similar Koen describes the Front End as “the target of increasing attention because of the widely-perceived lack of high-profit ideas entering the New Product and Process Development (NPPD) process.” (Koen et al., 2001)

Besides Cooper many researchers agree on the fact that “the front end of innovation, or what is often called the Fuzzy Front End (FFE), presents one of the greatest opportunities for improving the overall innovation process” (Koen et al., 2001). And „the existing findings indicate the Front End process as having the largest potential for improvements at the least effort possible“ (Nobelius/Trygg, 2002).

The reasons for the enormous influence of the FFE are twofold. First, as Cooper and Koen stated good ideas are the key ingredient for a successful NPD-process. If the NPD pipeline is not continuously fed with the best possible ideas no NPD-process can lead to superior products in the market. Second, the FFE is the phase of the innovation process in which most of the product details are defined: Up to 85% of product life cycle costs, 80% of the schedule and 70% of the quality are defined during FFE activities, but only 5-7% of total costs incur (Herstatt/Verworn, 2003; Specht/ Beckmann, 1996). Because of these two reasons the FFE is the key to overall NPD-success. Although these stated potentials haven’t been utilised so far, the early phases belong to the topics with only limited theoretical and empirical insight so far (Herstatt/Verworn, 2003).

Organisational Culture and the Front End

The objective of this study is to contribute to the improvement of FFE success. In previous papers different key success factors like top-management support, internal and external communication, resources, strategy, process activities and other factors for FFE success have been hypothesized and discussed by the authors (Kohn/Hüsig, 2003; Kohn et al., 2005). Most of these conceived success factors are similar to the well known success factors of the NPD-process (Cooper, 2001). Also the role of organisational culture has been part of the discussion. While the importance of organisational culture for the overall innovation success has been proved in the past (Ernst, 2003) the role of culture especially in the FFE has been researched on a theoretical or case basis only. Most authors stress the importance of organisational culture. Khurana/Rosenthal (1998) highlights the role of culture as one way to control and steer the FFE. They find “two general approaches”, “a formal process” or “a company-wide culture” to manage the FFE. While formalization seems to be good for less radical innovations an adequate organisational culture can create breakthrough innovations and seems to be the more suitable aligning element for the FFE. (Khurana/Rosenthal, 1998). Similar thoughts are mentioned by Buckler and Herstatt/Verworn who advocates different cultures for FFE and NPD since both parts of
the innovation process have different requirements (Herstatt/Verworn, 2003; Buckler, 1997). The early phases require creativity and freedom in order to cope with the high uncertainty concerning market and technology. Frequently, organisational culture and vision provide the sole orientation for the people working in the FFE, which again highlights the significance of the organisational culture for the FFE.

One basic problem is to grasp the concept of organisational culture (Ernst, 2003). Here, we follow the definition of Schein (1985): “Organisational culture: a pattern of basic assumptions – invented, discovered, or developed by a given group as it learns to cope with its problems of external adoption and internal integration – that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems”. Speaking: Culture is the underlying scheme that leads employees’ motivation towards or against innovation activities. It is important to note that we view organisational culture as an internal variable which can be influenced by the management rather than a metaphoric description of the company itself (Smircich, 1983).

Elements of a stimulating and positive FFE culture are mentioned in literature as well. One important element seems to be a market orientation (Koen et al., 2002; Murphy/Kumar, 1997), or as Coyne (2001) puts it: “Companies need to know the needs of those for whom they are changing, their customers”. Another important element is a flexible, decentralized organisation which facilitates internal and external communication (Coyne, 2001; Kim/Wilemon, 2002) that stimulates the generation of new ideas.

**HYPOTHESES DEVELOPMENT**

**Organisational Culture**

As stated in the introduction organisational culture is an important element for analysing FFE performance. Due to the high uncertainty immanent in the FFE the role of organisational culture as a guiding principle cannot be underestimated. In addition to other core corporate values like brand identity, vision and mission organisational culture will act as a guiding principle for the activities in the front-end. Besides giving guidance to the employees the organisational culture also influences how the company and its employees communicate internally and externally.

To better understand and to describe the concept of organisational culture we want to follow, the model of Deshpande and Webster (1989) and its adaption from Campbell and Freeman (1991) as illustrated in Figure 1. Based on two dimensions four culture types can be identified. “The two dimensions describe the continua that range from organic to mechanistic processes and from internal maintenance to external positioning.” (Bearden/Netemeyer (Ed.), 1998). The four cultural types of Clan-, Adhocracy-, Hierarchy- and Market-Culture, their positions according the two dimensions as well as their most important characteristics can be seen in Figure 1.

According to the findings from other researchers presented in the introduction an external market orientation as well as flexible and dynamic processes should contribute positive to FFE performance. Additionally the adhocracy culture is typically seen as the most innovative stimulating culture (Ernst, 2003). Both of these facts lead to our first hypothesis:
Internal orientation
(organization and fric
Internal orientation
(organization and frictionless activities)

Mechanical processes
(control, stability, organization)

Organic processes
(flexibility and spontaneity)

Clan culture
- Dominant characteristics: teamwork, sense of family, participation
- leadership: mentor, father- or mother- figure
- relationship: loyalty, tradition, personal relationships
- Strategic focus: evolution of human resources, moral, commitment

Adhocracy Culture
- Dominant characteristics: entrepreneurship, creativity, ability of adaptation
- leadership: entrepreneur, innovator, risk taker
- relationship: Entrepreneurship, flexibility, risk
- Strategic focus: Innovation, growth, new resources

Hierarchy culture
- Dominant characteristics: organization, regularities and instructions, uniformity
- leadership: coordinator, administrator
- relationship: rules, fundamentals, processes
- Strategic focus: stability, predictability, frictionless process flow

Market culture
- Dominant characteristics: competitiveness, achievement of objectives
- leadership: decision- and goal-oriented
- relationship: agreement on objectives, competition, goal-orientation
- Strategic focus: competitive advantage and market leadership

Figure 1: Cultural Model (Cameron/Freeman, 1991).

H1: The more a company displays the characteristics of the Adhocracy culture, the more successful the company will be in the front-end.

Diametrically opposed to the Adhocracy culture in Figure 1 you find the Hierarchy culture. This culture is focused on stability and smooth operations which lead to mechanical processes and an internal orientation. Consequently, we formulate our second hypotheses:

H2: The more a company displays the characteristics of the Hierarchy culture, the less successful the company will be in the front-end.

Front-end Success

In order to test our hypothesis an important question to answer is how FFE success can be measured. Most NPD measures focus on financial based measures (ROI, profit, revenue etc.) (Griffin and Page, 1993; 1996). Unfortunately these measures have a high time-lag with regards to FFE activities. Taking into account that the whole development and market introduction process is in-between, this time lag can be anywhere between 1 and 5 years or sometimes even longer. Bearing in mind that FFE activities gained much management attention during the last couple of years the current FFE activities will lead to changes in financial numbers in a few years from now on. Hence, the current financial results reflect FFE practices that are not existent any more. Additionally we fear that the relation between FFE activities and company performance will be moderated by too many other factors to show clear results. Therefore we decided to use qualitative success measures for direct FFE success. To define our success measures we looked at the core task of the FFE: To define development projects that help the company to strengthen its competitive situation. This task can be seen as accomplished if the following factors are fulfilled:

- **Clear definition of development projects**: At the beginning of FFE activities the existing information level is low and therefore the uncertainty high. Therefore one major result of FFE activities is the acquisition of know-how. FFE activities can be seen as successful if all needed information (technical and marketing) to develop a new product or service has been gathered (Moenaert et al., 1995).
• **Satisfying front end portfolio**: The new development projects need not only to be clearly defined; they must be the right projects. Responsible people should feel confident that their current front-end portfolio is satisfying, that it will strengthen the competitive position of the company and satisfy the needs of the targeted customers.

• **High degree of newness**: Companies need a balanced portfolio of new products and services. The continuous improvement of the existing product line – incremental innovations – does not necessarily take place in the FFE and is typically less problematic to achieve for the companies. The real challenge companies face is to find radical innovations (Herstatt et al., 2003). Moreover, innovativeness can be and has been specified as moderator, independent or dependent variable in comparable studies (Daneels/Kleinschmidt, 2001). Therefore we include the degree of newness in the success measures for the FFE.

Therefore our hypothesis can be specified:

H11: The more a company displays the characteristics of the Adhocracy culture, the higher the level of technical and marketing information will be.

H12: The more a company displays the characteristics of the Adhocracy culture, the more satisfying the front-end results will be.

H13: The more a company displays the characteristics of the Adhocracy culture, the higher the degree of newness of its product portfolio will be.

H21: The more a company displays the characteristics of the Hierarchy culture, the lower the level of technical and marketing information will be.

H22: The more a company displays the characteristics of the Hierarchy culture, the less satisfying the front-end results will be.

H23: The more a company displays the characteristics of the Hierarchy culture, the lower the degree of newness of its product portfolio will be.

**METHODOLOGY**

**Measure Development**

We tried to use existing multi-item scales from prior studies wherever feasible. For organizational culture we used the construct cited in the Handbook of Marketing Scales (Bearden/Netemeyer (Ed.), 1998) of Deshpande/Webster (1989). The construct consists of 16 different items, grouped into the four different issues of: “kind of organisation”, “leadership”, “what holds the organization together” and “what is important”. Each cultural type is represented in each issue by one item. Respondents are asked to distribute 100 points for each issue. Therefore, organisational culture is based on a constant sum scale which results in ipsative data. All of our other scales consist of a 5-point likert scale. The appendix provides a summary with all remaining items and their sources. In case no source is quoted the item has been developed by using a three step approach: First the item was based on findings of a literature study and case studies, second we did a pre-test with several academics, consultants and practitioners, and third the items have been adjusted if necessary. Market and technological dynamics have been added as control variables to take industry differences into consideration. Our measurement model can be seen in Figure 2.
Sample and data collection

We tested our model using a survey that was distributed among interested companies in Europe and the US. Since this study was part of a more complex research project the questionnaire was too large to be send out by mail. We believe that the more innovative companies showed a higher interest in our study. Therefore our sample cannot be seen as representative but a positive bias has to be assumed. Although we did not focus on a certain industry our sample involves mainly companies from manufacturing industries. In order to improve the quality of our research we asked for at least two different informants from the marketing and the R&D department respectively for each company to answer our questionnaire. In total 118 companies took part in this survey, 74 of them with at least two informants, resulting in 201 questionnaires in total and 155 questionnaires from the companies with at least two informants. For the data analysis we used the smaller sample of 155 questionnaires for which we had dyadic measurements.

Figure 3 shows the industry distribution in our sample, Table 1 summarizes the most important descriptive statistics. The participating companies ranged from pure R&D units of large companies (R&D spending = 100%) to start-up companies currently developing their products (revenue < 1 Mio €). Overall we feel that the median describes our sample much better than the mean which is distorted by very few participants like the before mentioned R&D units and start ups. The typical participant can be characterized as a medium-sized company of roughly 450 employees, which has been in business for nearly 50 years and has spent 5% of its 100 Mio € annual revenues in the previous year on R&D. Our informants were the CEO’s, heads of R&D departments and/or heads of marketing departments.

DATA ANALYSIS

First, for the whole dataset an exploratory factor analysis was performed for the success and contingency variables. Second, resulting factors have been tested in a confirmatory factor analysis for the two different groups of informants separately. Since culture was measured using a constant sum scale - resulting in ipsative data - factor analysis could not be used to assess unidimensionality. Reliability however was assessed by calculating coefficient alpha. (Baker et al., 1999; Baron, 1996; Dunlap/Cornwell, 1994; Saville/Willson, 1991) The summary of the results of these assessments can be found in the following Table 2.
Figure 3: Sample distribution by industry.

<table>
<thead>
<tr>
<th># of employees</th>
<th>Revenue</th>
<th>R&amp;D spending</th>
<th>Age of organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time equivalents</td>
<td>Mio €</td>
<td>% of revenue</td>
<td>years</td>
</tr>
<tr>
<td>Mean</td>
<td>1.865</td>
<td>319</td>
<td>11,5</td>
</tr>
<tr>
<td>Minimum</td>
<td>3</td>
<td>0,1</td>
<td>0,0</td>
</tr>
<tr>
<td>Maximum</td>
<td>54.000</td>
<td>7.000</td>
<td>100,0</td>
</tr>
<tr>
<td>Median</td>
<td>449</td>
<td>100</td>
<td>5,0</td>
</tr>
</tbody>
</table>

Table 1: Sample characteristics.

<table>
<thead>
<tr>
<th>Culture</th>
<th># items remaining</th>
<th>Cronbachs's alpha</th>
<th>Minimal Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhocracy</td>
<td>4</td>
<td>0,81</td>
<td>0,76</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>4</td>
<td>0,84</td>
<td>0,80</td>
</tr>
<tr>
<td>Market</td>
<td>4</td>
<td>0,51</td>
<td>0,41</td>
</tr>
<tr>
<td>Clan</td>
<td>4</td>
<td>0,69</td>
<td>0,63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Front End Success</th>
<th># items remaining</th>
<th>Cronbachs's alpha</th>
<th>Minimal Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Information</td>
<td>3</td>
<td>0,89</td>
<td>0,74</td>
</tr>
<tr>
<td>Technical Information</td>
<td>6</td>
<td>0,89</td>
<td>0,65</td>
</tr>
<tr>
<td>Overall Success</td>
<td>3</td>
<td>0,85</td>
<td>0,80</td>
</tr>
<tr>
<td>Degree of newness</td>
<td>2</td>
<td>0,68</td>
<td>0,76</td>
</tr>
</tbody>
</table>

KMO Measure: 0,82 Total-Variance explained: 74,67%
R&D Informants: GFI=0,969; AGFI=0,954; RMR=0,065; Average variance explained: 0,60
Marketing Informants: GFI=0,971; AGFI=0,957; RMR=0,066; average variance explained=0,65

Table 2: Summary statistics for constructs.
Table 2: Summary statistics for constructs (continued).

<table>
<thead>
<tr>
<th>Contingency Variables</th>
<th># items remaining</th>
<th>Cronbach's alpha</th>
<th>Minimal Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Dynamics</td>
<td>4</td>
<td>0,81</td>
<td>0,67</td>
</tr>
<tr>
<td>Market Dynamics</td>
<td>2</td>
<td>0,70</td>
<td>0,84</td>
</tr>
<tr>
<td>KMO Measure:</td>
<td>0,78</td>
<td>Total-Variance explained: 69,88</td>
<td></td>
</tr>
</tbody>
</table>

R&D Informants: GFI=0,981; AGFI=0,95; RMR=0,086; Average variance explained: 0,53
Marketing Informants: GFI=0,989; AGFI=0,971; RMR=0,056; average variance explained=0,52

The results show satisfying values with two exemptions. The cronbach’s alpha for the market and clan culture are below the 0.7 threshold. Our alpha values for adhocracy (0,81), hierarchy (0,84), market (0,51) and clan (0,69) are except for the market culture higher than in the reference article cited in the Handbook of Marketing Scales with \( \alpha_{adhocracy} = 0,66 \), \( \alpha_{hierarchy} = 0,71 \), \( \alpha_{market} = 0,42 \) resp. \( \alpha_{clan} = 0,42 \) and similar to the results published by other researchers (e.g. Conrad et al. (1997)). Since our hypotheses focus only on adhocracy and hierarchy culture the low values for market and clan culture will not negatively influence our research. Nevertheless, we kept those two components of the culture scale “because it is part of the broader conceptual framework” (Deshpande et al., 1993).

After the assessment of our constructs we analysed the interdependencies between these constructs. Table 3 shows the results of a correlation analysis. The correlation analysis shows significant positive results between adhocracy culture and all of our success measures as well as significant negative results between hierarchy culture and most of our success measures. Only the relation between hierarchy culture and marketing information is not significant although negative. The other cultural types show no significant relation towards the success measures.

In a next step we performed a single linear regression as shown in Table 4. Adhocracy and hierarchy culture are showing significant positive and negative respectively correlations with all of the four different success measures. In a final step we tested whether the predictive model can be optimized by using multiple linear regression or the inclusion of the contingency variables. Since the independent variables are correlated among each other a major improvement by using multiple linear regression with more than one independent variable cannot be expected to lead to different or significant better results. Although in two cases an improvement of the model was possible as depicted in Table 5. In the model for “overall success” the combination of the hierarchy and adhocracy culture type leads to a significant better prognosis than for one of these cultural types on its own. For the success variable “degree of newness” the inclusion of the contingency variable “technological dynamics” the performance of our predictive model can be improved significantly. For the prediction of market and technical information as success measure a simple model with only adhocracy culture as a predictor included yields the best results.
Table 3: Correlations.

<table>
<thead>
<tr>
<th></th>
<th>Marketing Information</th>
<th></th>
<th>Technical Information</th>
<th></th>
<th>Overall success</th>
<th>Degree of Newness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Estimate</td>
<td>Adjusted R²</td>
<td>F</td>
<td>Standard Estimate</td>
<td>Adjusted R²</td>
<td>F</td>
</tr>
<tr>
<td>Adhocracy</td>
<td>0,17</td>
<td>0,02</td>
<td>4,22*</td>
<td>0,27</td>
<td>0,07</td>
<td>11,89***</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>-0,15</td>
<td>0,02</td>
<td>3,23*</td>
<td>-0,24</td>
<td>0,05</td>
<td>9,46***</td>
</tr>
<tr>
<td>Market</td>
<td>-0,01</td>
<td>-0,01</td>
<td>0,02</td>
<td>0,09</td>
<td>0,00</td>
<td>1,27</td>
</tr>
<tr>
<td>Clan</td>
<td>-0,02</td>
<td>-0,01</td>
<td>0,04</td>
<td>-0,08</td>
<td>0,00</td>
<td>1,05</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

Table 4: Results of single linear regression.

<table>
<thead>
<tr>
<th></th>
<th>Standard Estimate</th>
<th>Adjusted R²</th>
<th>F</th>
<th>Standard Estimate</th>
<th>Adjusted R²</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhocracy</td>
<td>0,48</td>
<td>0,22</td>
<td>44,58***</td>
<td>0,44</td>
<td>0,19</td>
<td>36,53***</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>-0,50</td>
<td>0,24</td>
<td>49,04***</td>
<td>-0,38</td>
<td>0,14</td>
<td>25,16***</td>
</tr>
<tr>
<td>Market</td>
<td>0,06</td>
<td>0,00</td>
<td>0,57</td>
<td>-0,05</td>
<td>0,00</td>
<td>0,37</td>
</tr>
<tr>
<td>Clan</td>
<td>0,03</td>
<td>-0,01</td>
<td>0,10</td>
<td>0,02</td>
<td>-0,01</td>
<td>0,09</td>
</tr>
</tbody>
</table>

*** significant on the 0.01 level
** significant on the 0.05 level
*  significant on the 0.1 level
<table>
<thead>
<tr>
<th>Overall satisfaction</th>
<th>Degree of newness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Estimate</td>
</tr>
<tr>
<td>Adhocracy</td>
<td>0,24</td>
</tr>
<tr>
<td>Hierarchy</td>
<td>-0,32</td>
</tr>
<tr>
<td>Technological Dynamics</td>
<td></td>
</tr>
</tbody>
</table>

*** Significant on the 0,01 level  
** Significant on the 0,05 level  
* Significant on the 0,1 level

Table 5: Results of multiple linear regression analysis.

DISCUSSION OF THE RESULTS

The objective of this study was to test whether a certain type of organisational culture is beneficial for front-end success or not. By looking at our data this question can be answered based on a larger empirical underpinning. An external orientation based on organic processes like the Adhocracy culture leads to better FFE results than an internal and process orientated culture like the Hierarchy culture. We found support for all of the postulated hypotheses in our data.

In detail our study shows that the Adhocracy culture is positively correlated with the information level with respect to technical and marketing information prior to the start of development. This means that having a market oriented culture with a focus on informal information to disseminate information internally leads to a higher level of information, therefore a reduced uncertainty and a higher chance for success for the remaining NPD process. Therefore Hypothesis $H_{11}$ is supported. An internal orientated culture with a focus on process orientation on the other hand leads to a lower level of information. Therefore Hypothesis $H_{21}$ is supported.

Additionally an Adhocracy culture leads to a higher satisfaction level with regards to the front-end results itself. Companies whose employees continuously interact with the marketplace and at the same time have the freedom to create new ideas will most likely have more opportunities and ideas to choose from. Also they will have more information to judge these opportunities and ideas and what is more important can develop improved ideas and concepts based on this additional information. Therefore Hypothesis $H_{12}$ is supported.

Companies who motivate their employees to concentrate on internal issues will most likely not have those benefits. Therefore Hypothesis $H_{22}$ is supported.

Last but not least: Adhocracy culture leads to a higher degree of newness for the company. As can be seen in Table 5 the degree of newness is strongly moderated by the external variable “technological dynamics” which describes the environment a company operates in. Since the environmental dynamics play a crucial role a company who stresses an external orientation is therefore better positioned than an internal orientated one. Also, radical innovations call for a more flexible organic organisation, rather than mechanistic processes. The Adhocracy culture therefore promotes the degree of newness; the Hierarchy culture hinders the evolvement of radical products. Therefore $H_{13}$ and $H_{23}$ are supported.
CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

It could be found that companies who are dominated by an Adhocracy culture are likely to produce more successful front-end results than companies who are dominated by a Hierarchy culture. Having said this several questions remain unanswered.

First: Do superior FFE results lead to superior financial performance? This research only analysed the role of organisational culture on the FFE. Our findings indicate that an Adhocracy culture leads to improved FFE results, i.e. more and better new product and service concepts, a better level of information and a higher degree of newness. Whether or not the realisation of highly innovative concepts leads to improved company performance has not been part of this research (Sandvik/Sandvik, 2003; Hee-Jae/Pucik, 2005). Future research should use longitudinal approaches in order to monitor the success of front-end practices all over the NPD process and finally to measure the influence on the financial success of a company. Measures interesting to monitor are: death-rate of selected projects, meeting of time, quality and financial development objectives as well as finally the influence on company revenue and profit.

Second: Is it more suitable to produce new product concepts in-house or to outsource this process? When we discussed the findings of our research with some industry practitioners we heard quite similar statements from different people: Many of these people recognized our model of organisational culture. By reflecting this model on their companies they found that their companies changed their dominant cultural type over time. Starting with a Clan culture when the company was founded, moving to Adhocracy culture when the company grew, moving onwards to Market culture when the company grew further and developed into a large enterprise. Some of them fearing that they are moving to a Hierarchy culture in the future. Interestingly the innovation patterns changed along with the cultural types. During the time when Clan culture was dominating the founder himself was the innovation engine, later during the domination of Adhocracy many radical innovations have been born, now being in a Market culture especially large enterprises tend not to develop their radical innovations themselves but rather to acquire smaller companies who already successfully proofed their innovative concepts in the market.

Third: How can an organisational culture be changed? In case managers want to produce better FFE results by changing their organisational culture towards an adhocracy type it remains unanswered by our research how to do it. Further in depth case studies might help to improve our knowledge here in future.

Besides those unanswered questions various limitations of our research are founded in our data sample and our success measures. First, our data is not representative but will most likely have a positive bias. Second, our front-end success measures are only of qualitative nature and rely on the subjective judgement of the informants.

Our research shows that the FFE does not need to be fuzzy, but that an adequate culture, organisation and process can help to generate a successful portfolio of NPD projects. This research could help as a guideline for managers on what factors to focus on in order to improve FFE success. Industry managers should be aware of the importance of an Adhocracy culture for front-end performance. By doing so, companies can benefit from the huge improvement potential existing in this area. Besides the organisational culture practitioners must keep in mind that other factors, especially the front-end process play an important role as well.
REFERENCES


APPENDIX

Measures, remaining items and sources

<table>
<thead>
<tr>
<th>I) Organisational Culture (Bearden/Netemeyer (Ed.), 1998)</th>
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<tbody>
<tr>
<td><strong>Kind of Organisation?</strong></td>
</tr>
<tr>
<td>A) My organisation is a very <strong>personal</strong> place. It is like extended family. People share a lot of themselves. (Clan-Culture)</td>
</tr>
<tr>
<td>B) My organisation is a very <strong>dynamic</strong> and entrepreneurial place. People are willing to stick their necks out and take risks. (Adhocracy Culture)</td>
</tr>
<tr>
<td>C) My organisation is a very <strong>formalized and structural</strong> place. Established procedures generally govern what people do. (Hierarchy Culture)</td>
</tr>
<tr>
<td>D) My organisation is very <strong>production oriented</strong>. A major concern is with getting the job done without much personal investment. (Market Culture)</td>
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<table>
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<tr>
<th><strong>Leadership?</strong></th>
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<tr>
<td>A) The head of my organisation is generally considered to be a <strong>mentor, sage,</strong> or a father or mother figure. (Clan-Culture)</td>
</tr>
<tr>
<td>B) The head of my organisation is generally considered to be an <strong>entrepreneur,</strong> an <strong>innovator,</strong> or a risk taker. (Adhocracy Culture)</td>
</tr>
<tr>
<td>C) The head of my organisation is generally considered to be a <strong>coordinate</strong>, an <strong>organizer,</strong> or an <strong>administrator</strong>. (Hierarchy Culture)</td>
</tr>
<tr>
<td>D) The head of my organisation is generally considered to be a <strong>producer,</strong> a <strong>technician,</strong> or a <strong>hard-driver</strong>. (Market Culture)</td>
</tr>
</tbody>
</table>
What holds the organisation together?

A) The glue that holds my organisation together is loyalty and tradition. Commitment to this firm runs high. (Clan-Culture)
B) The glue that holds my organisation together is commitment to innovation and development. There is an emphasis on being first. (Adhocracy Culture)
C) The glue that holds my organisation together is formal rules and policies. Maintaining a smooth-running institution is important here. (Hierarchy Culture)
D) The glue that holds my organisation together is the emphasis on tasks and goal accomplishment. A production orientation is commonly shared. (Market Culture)

What is important?

A) My organisation emphasises human resources. High cohesion and morale in the firm are important. (Clan-Culture)
B) My organisation emphasises growth and acquiring new resources. Readiness to meet new challenges is important. (Adhocracy Culture)
C) My organisation emphasises permanence and stability. Efficient, smooth operations are important. (Hierarchy Culture)
D) My organisation emphasises competitive actions and achievements. Measurable goals are important. (Market Culture)

II) Technological Dynamics (Jaworski/Kohli, 1993)

- The technologies in our industry are changing rapidly.
- Technological changes provide big opportunities in our industry.
- A large number of new product ideas have been made possible through technical breakthroughs in our industry.
- Major technological changes in our industry are rather scarce.

III) Market Dynamics (Jaworski/Kohli, 1993)

- In our kind of business, customers’ product preferences change quite a bit over time.
- Our customers tend to look for new products all the time.

IV) Marketing Information Success (adapted from Moenaert et al., 1995)

With regard to relevant marketing information we gather all relevant information prior to the start of development. We reduce therefore the marketing uncertainty prior to the start of development as much as possible with regards to...

- ... the required marketing and sales personnel.
- ... the required marketing and sales resources.
- ... the marketing strategy for this project.

V) Technical Information Success (adapted from Moenaert et al., 1995)

With regard to relevant technical information we gather all relevant information prior to the start of development. We reduce therefore the technical uncertainty prior to the start of development as much as possible with regards to...

- ... the product/service design.
- ... the required R&D strategy for this project.
- ... the characteristics of the applied technologies.
- ... the choice of product technologies.
- ... the required R&D personnel for this project
- ... the required technological resources for this project.

VI) Overall Front-end Satisfaction

- I am completely satisfied with our current Front-end portfolio.
- Our current Front-end portfolio will strengthen our competitiveness.
- Our current Front-end portfolio solves the identified needs of our potential customers.

VII) Degree of newness (based on Schlaak, 1999)

- New products or services developed by my organisation offer our customers usually a new technology.
- New products or services developed by my organisation of our customers usually new and unique functionalities.