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Organising R&D in Globalised Context: Convergence or Divergence?
The Relative Influence of Dutch and Foreign Cultures on the Organisational Structure of R&D in Multinational Corporations[**]

This paper examines national culture as an explanatory variable in the convergence versus divergence debate of R&D organisational structures. It explores the effects of globalisation on the way in which R&D processes are structured at group level. It is argued that culture may have a decisive effect on R&D group-structure. On the one hand the results of the study observe a converging trend towards a universal organisational structure under influence of a predominantly Anglo-Saxon-based culture. On the other hand, there is a persistence of differences owing to the dominance of the domestic culture on the one side and the increasing multicultural composition of the R&D staff at the laboratories on the other side, which points to divergence.

The research was conducted at eight of the ten most innovative MNCs in the Netherlands. It builds on scientific studies regarding organisational design in R&D (Chiesa 1996, 2001; Donaldson 2001; De Sitter 1998; Tidd et al. 2001) and includes the conceptual frameworks by Hofstede for analysing cultural diversity, complemented by contributions to the convergence-divergence debate (Ferner 1997; Harzing/Sorge 2003).

Key words: **National Culture, Research & Development, Organisational Structure**

1.   Introduction

There is a broad discussion about the influence of globalisation on the structure of organisations (Harzing/Sorge 2003; Donaldson 2001; Casson/Singh 1993; Birkinshaw et al. 2002; Chiesa 1996; Ferner 1997). The main line of this debate is formed by the notions of organisational-convergence and organisational-divergence. The subject of the organisational convergence-divergence debate is: "how far organisations in different countries have travelled along a path to global convergence in operations and management and, conversely, to what extent the influence of specific cultural factors must be understood and planned if the manager is to be effective in cross-cultural situations" (Pugh/Hickson 1996: 38-99). Convergence implies a relative degree of disembeddedness of practices or structures, overriding more regionally or nationally specific institutions or behavioural predispositions. It is the result of responding to the 'rational' contingencies, such as technology, innovation, environmental change, or market change that arise in an increasingly international context, which makes them universally present. It may also be a response to institutional harmonisation through, for example, supranational government and rule making (Harzing/Sorge 2003). Divergence is conterminous with the embeddedness of organisations and other actors in regionally or nationally different societies or in any other locally more idiosyncratic arrangements (Harzing/Sorge 2003; Harzing et al. 2002).

Given the breadth of the convergence-divergence debate and its duration in time, discussions have become rather blurred because different definitions have been assigned to the same concepts (Geppert et al. 2001). Also the theoretical focus is not clear-cut when it comes down to the subject of convergence and divergence (Boyer 1996; Child 2000).

The first problem that participants of the debate are confronted with is the ambiguity about the organisational level of analysis. Cultural influence affects the organisational structure on all levels – macro, meso and micro[1] – in various ways, though not always directly perceptible. This limited visibility leads to disordered use of variables at these levels, without indicating the causal and conceptual relationships between these variables (Reinhardt 2004).

In this paper, we argue that a more subtle understanding is required of the influence of national culture on organisational design, recognising the effects of culture at different levels of structure in organisations.

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[1]   The *macro* level, which is the highest organisational level, comprises the organisation as a whole of subsystems whether or not dispersed over different locations in one or more countries over the world. The *meso* level contains de organisation of the different independent subsystems (companies, business units, factories) within the corporate headquarters. The *micro* level forms the smallest analysable organisational unit. It comprises the production and control structure of the 'group'. This group can be a project team grouped on the basis of a product or service of a specialised department, or on the basis of common specialised functions or somewhere in between these ideal types. Characteristic of groups is the fact that its members cooperate intensively.

A second problem is the superficial operationalisation of the notion of *structure* that leaves the characteristics of structure on which culture exerts influence unclear (Harzing/Sorge 2003; Shane et al. 1995; Lolla/Davis 1991). We try to understand of precisely which aspects of structure are influenced by culture and which are not. This requires a clear concept of the idea of organisational structure.

A third and last problem identified is the organisational level at which statements about the culture-structure relationship are made. Most studies involve the macro or meso level of the organisation in relation to the regional or national societies in which they exist (Casson/Singh 1993; Birkinshaw et al. 2002). Research on the micro level of the group is rare. Whereas cultural differences manifest themselves most clearly at this level, where people cooperate closely (Hofstede 1991; Lolla/Davis 1991). This is why we have chosen to focus on the micro level.

From the general research question in the convergence-divergence debate: "How and where, within an overall trend toward globalization, (will) national cultures and institutions continue to shape organisational forms and behaviour" (Child 2000: 54-5), our specific interest goes out to the influence of different foreign cultures on the structuring of the Multinational Corporations (MNCs). Do these multicultural influences lead to divergence of structures or are converging forces of technology, world markets and investors stronger?

The decision to examine MNCs seems obvious. Over the past two decades MNCs have become more and more globalised (Jones/Davis 2000). It is this kind of organisation where the convergence and divergence debate is currently taking place (Harzing et al. 2002). For several reasons, our research is more specifically focused on the organisation of R&D processes within MNCs and the influence that national culture exerts on it.

First, globalisation has an enormous effect on the R&D context, i.e., the nature of the questions asked and of the problems to be solved; this also goes for R&D financers and for R&D buyers. As a result MNCs have located their R&D function in subsidiaries abroad, and, simultaneously, employed R&D professionals across the borders of their country of origin to be active in foreign laboratories for a certain period of time (Chiesa 1996; Gassmann/Von Zedtwiz 1998).

Second, communication lines between actors within R&D processes are not much standardised or routine-based and therefore place considerable demands on communicative skills. As a result, cultural factors are assumed to play an important part. Finally, many professionals from different countries and cultures are active in one and the same laboratory: the R&D environment is highly international and de-contextualised.

Based on these considerations we have formulated the following research question:
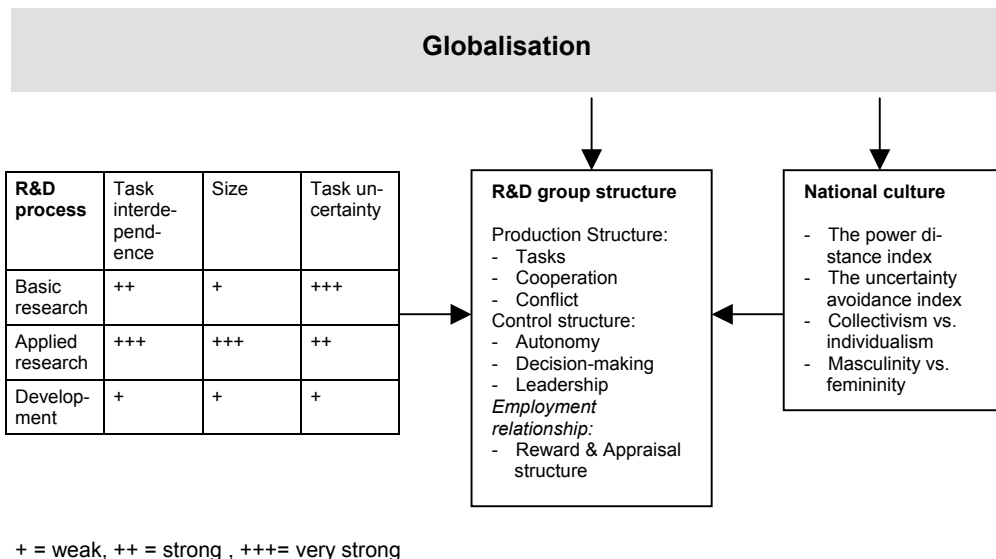
> "What are the effects of globalisation and national culture on how R&D processes in MNCs are organised at group level? Is there a tendency towards one dominant way of structuring as a result of the converging environment or conversely, does the increasing multicultural composition of research staff maintain the diversity of organisational structures?"

The next section discusses the relevant concepts that enable the development of the conceptual model. Section 3 provides a short outline of the applied methodology, as well as a description of the eight cases. The results of the empirical research are reflected in Section 4. Finally, the conclusions are presented in Section 5.

2. Conceptual background

Three concepts form the frame of our conceptual model: R&D-processes, Structure of the R&D-group and National culture. Given the different types of R&D processes the research examines the influence of national culture on the design of R&D group structure in the global context. In this section we describe the three concepts and how these have been operationalised and linked in the conceptual model that has been used in the research (see Figure 1). By means of a number of questions we aim to learn about the specific relationship between the variables.

Figure 1: The relative influence of national culture on the R&D group structure: A conceptual model

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Globalisation

R&D process	Task interde- pend- ence	Size	Task un- certainty
Basic research	++	+	+++
Applied research	+++	+++	++
Develop- ment	+	+	+

R&D group structure

Production Structure:
- Tasks
- Cooperation
- Conflict

Control structure:
- Autonomy
- Decision-making
- Leadership

Employment relationship:
- Reward & Appraisal structure

National culture

- The power di- stance index
- The uncertainty avoidance index
- Collectivism vs. individualism
- Masculinity vs. femininity

+ = weak, ++ = strong , +++= very strong

The R&D process

In order to be able to draw responsible conclusions about the impact of national culture on R&D structure and by that on the innovative capacity of the R&D processes, it is necessary to distinguish between the different types of R&D processes. After all, each type has a different optimum group structure for innovation (Simonse 1998). For instance, fundamental research, in which neither the outcome of the research process nor the approach of the process are given , has a much more open structure of labour division than a comparatively standardised development process in which the product is largely fixed.

Donaldson (2001) proposes terms for the classification of R&D processes. He defines each kind of R&D activity by a certain degree of *task uncertainty, task interdependence,* and *size.* These construct-variables form a coherent whole, as they are highly intertwined. They function as contingencies for structuring processes of labour at the micro level. S*ize* affects structure when the 'complexity' and 'variability' (Fruytier 1994) increase because of the intensified involvement of a multitude of disciplines in one R&D project. Simultaneously, this strengthens the reciprocal *interdependence* of R&D professionals, since they need each other to conduct their own operations. As future interactions cannot be predicted, reciprocal interdependence cannot be coordinated through planning and requires other means of coordination (Thompson 1967, Hendriks/Fruytier 2004). The crucial aspect is not that the interdependence is reciprocal or that it may be frequent, but that it is *uncertain* (Donaldson 2001): the 'analysability' of the process (Perrow 1970).

Chiesa (2001) distinguishes three kinds of R&D activities: *basic research*, *applied research* and *development*. These three kinds of R&D are typified by a degree of task interdependence, task uncertainty and size, as it is inherent to the character of the associated R&D processes (see Figure 1).

Structure of the R&D groups

R&D group structure needs to be shaped in such a way that it organises both for knowledge and creativity. The convergence – divergence debate is relevant to the perspective of these two variables, as it is interesting to establish the effects of structure-converging and structure-diverging forces on knowledge exploration and exploitation by means of cultural influence (Birkinshaw, 2002; Casson and Singh, 1993).

Although globalisation affects the organisation of R&D at all levels throughout the organization, this paper studies only a part of these organization processes, namely the R&D group structure at the micro level. In other words, it concentrates on the influence of national culture on the structuring of tasks (Thompson 1967; Galbraith 1973; De Sitter 1998; Nadler/Tushman 1997) and the design of the employment relationship between employer and employee (Marsden 1998) at R&D *group* level. The field of the employment relationship comprises the allocation of tasks to the workforce and the task regulation within the workforce by contracts of employment in the internal and external labour market (Marsden 2000).

Structure of tasks

The structure of tasks at micro level shows how these tasks are grouped (production structure) and linked (control structure) within the R&D group. The production structure represents the division of operating tasks. The control structure deals with the question of regulation: 'who organises what and why'. The possibilities for structuring the operating and control tasks at micro level are determined by the design of the labour division at meso level. Both the production- and control structure produce relevant variables of the R&D group structure.

The *production structure* at group level engenders the variables *tasks*, *cooperation* and *conflict* (Simonse 1998*).* Since the production structure indicates the way in which *tasks* are distributed over the workforce, it establishes the task interdependence that neces-

sitates *cooperation* between people. The need for people to cooperate in a group entails the risk of *conflicts*: the more people depend on each other to fulfil their tasks, the greater their necessity to cooperate. In other words, the increased social interaction increases the chance of conflicts.

The *control structure* engenders the variables *decision-making, leadership* and *autonomy* (Simonse 1998). *Decision-making* is the coordination between tasks and indicates 'who decides what'. The variable *leadership* refers to the final responsibility of the project and to the group's management. The variable *autonomy*[2] points to the degree to which the R&D group is authorised to make decisions. Internal, operational autonomy points to the possibilities of the group or individual, given certain assigned tasks or assignments, to interpret the execution of these tasks or assignments in their own way; external, strategic autonomy points to the possibilities to exert influence on the nature of tasks and assignments, and the context in which these tasks must be executed (Bailyn 1985: 134). This variable has great impact on the motivation and commitment of professionals in R&D (Pelz/Andrews 1976). It offers recognition and appreciation for the self-organising abilities of groups and individuals within it (Bailyn 1985) In this research the variable autonomy is therefore used in two ways: 1) as an attribute of structure, and 2) as a condition for the motivation and commitment of R&D professionals. Based on literature (Bailyn 1985), we assume that the variable 'autonomy' takes up a central position.

Employment relationship

Also the design of the employment relationship occurs in accordance to certain structures (Coase 1937; Simon 1951; Marsden 2000). From the concept of '(risk of) opportunism' in the employment relationship Marsden formulates a typology of employment rules for regulating the actions and motivation of employees. These rules "give rise to different Human Resource Management systems within firms and provide them with different types of organisational capabilities" (Marsden 1998: 3). The employment relationship between the R&D professional and the organisation produces the variable *reward & appraisal*. In R&D organisations these are elements of the extrinsic motivation of professionals that do not so much as provide satisfaction, but may intensify feelings of discontent if professionals' expectations are not met (Slootman 1991; Lawler 1973).

> Our attention especially goes out to the question which of these structure variables are most sensitive to cultural differences and whether there is a logical connection between these variables in particular (see Section 4.1).

National Culture

The 'independent or cause-variable' in our research is the national culture.

Hofstede (1991) explains that culture is the collective programming of the mind that distinguishes the members of one group or category of people from another. Kluckhohn (1951) elaborated on this concept and describes culture as: "consisting in

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2   Autonomy revolves around "strategic" autonomy: "to set one's own research directions" and to a smaller extent around "operational" autonomy: "the freedom to carry out tasks at one's own discretion" (Bailyn 1985).

patterned ways of thinking, feeling and reacting, acquired and transmitted mainly by symbols, constituting the distinctive achievements of human groups, including their embodiments in artefacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values". Nations are a source of considerable common mental programming of their citizens. Social anthropologists found that different nations are faced with common problems, for which they have different ways of facing.

Hofstede utilised these problems and integrated them into his five dimensions. He explains that a dimension is an aspect of culture that can be measured in relation to other cultures.

We have selected four of his dimensions to explore the influence of national culture on R&D organisation (Offereins 2004): the Power Distance Index, the Uncertainty Avoidance Index, Masculinity versus Femininity and Collectivism versus Individualism. The fifth dimension regards the time perspective, which was not taken into account due to the limited time available to conduct research at this scale.

> Departing from the selection of culture-sensitive variables of structure (Section 4.1) the subsequent question is how national culture affects R&D group structure (Section 4.2). An attempt is made to generate an answer by means of an empirical illustration of the general distinction made in the employment relationship literature: the distinction between the masculine, individualistic Anglo-Saxon culture on the one hand and the more feminine, collectivistic neo-corporatistic European culture on the other hand (Streeck 1988).

More and more professionals from different countries work in the R&D laboratoria of MNCs located in the Netherlands. This can have a converging or diverging effect on the R&D group structure.

> In Section 4.3 we will verify the extent to which the Dutch R&D organisations have adapted to the multicultural team composition and in what way. Respectively, notice is taken of the effect of culture in relation to other influencing factors such as technological development and commercial pressure on the market.

3.   Sample description and data collection

This research concerns a qualitative study consisting of a small number of purposefully selected informative samples. The empirical data was selected by means of a qualitative inquiry conducted at eight MNCs in the Netherlands, which are ASML, DSM, Océ, Organon (Akzo Nobel), Philips, Shell, Ericsson and Lucent Technologies (see Appendix 1). Main criterion of selection was their investment in the R&D function. Six of the eight MNCs examined belong to the top 10 of Dutch companies that invest the most in R&D and innovation. The sample was confined to the sectors of technology and chemistry. The industries that were included are chemistry, telecommunications, electronics, semi conductor and pharmacy.

The research material was gathered during a four-month period from January 2003 to May 2003. The data-gathering took place by means of face-to-face interviews with Dutch R&D managers following a semi-structured interview guideline. These managers informed us about the organisation structure of their company. They also provided us with information on their R&D teams, including the different nationali-

ties of the team members. The interviews were complemented by secondary literature such as annual accounts. The interview consisted of two parts: the first part focused on the laboratory and R&D project structures or group organisation. This part consisted of questions on the seven variables of structure. These questions elicited information on practices and structures rather than opinions on such practices. The second part addressed the influence of national culture on the R&D processes between and within these groups. The cultural influence was measured by valuing the variables of structure by means of the four cultural dimensions according to the operationalisation of Hofstede (1994). Although every care was taken to formulate questions as unambiguously as possible, answers to our questions might contain an element of perception, which might reduce the validity of our findings. The method used to examine the eight informative cases was the snowball or chain sampling approach. This method made it possible to find the key informants necessary to provide the data, which enabled us to formulate an answer to the research question. By asking leading R&D directors or managers who else to talk with, we were able to increase the total number of key informants. These key informants both functioned as respondent and informant. As respondent they provided us with information on the R&D (group) organisation and as informant they were able to inform us about the R&D professionals whom they managed.

4. Empirical results

This section contains the main outcome of the empirical research. We have studied eight R&D organisations of MNCs that either have their headquarters or their main R&D facility located in the Netherlands. Appendices 2 and 3 give a concise overview of the main collected data.

In Section 4.1 group structures of R&D laboratories are examined in order to detect the variables of structure that are 'sensitive' to cultural influences, as well as to the way they are organised. Section 4.2 describes the influence of the observed different cultures on R&D group structure and Section 4.3 describes how MNCs adapted to these cultural influences.

4.1 The relationship between national culture and structure

What are culture-sensitive variables of structure?

Autonomy

Of the seven variables with which group structure has been described at micro level, the variable autonomy appears to be most sensitive to cultural differences. The dimensions of culture that exert most influence on the (desired) autonomy in R&D organisations are the *Uncertainty Avoidance Index* and the *Power Distance Index*. The greater the professionals' tendency to avoid uncertainties in tasks and the higher the hierarchical distance to which they are used to in their country of origin, the less they feel the need for autonomy and the more they value strong leadership. This is important, since all MNCs examined apply far-reaching forms of decentralised decision-making and coordination of R&D activities. This sometimes even results into self-organising groups. The management intentionally has a high degree of trust in the experience,

knowledge and skills of the professionals and stimulates them to make their own choices. This approach is supposed to stimulate the professionals' motivation and by that their creativity. However, not taking into account the need for certainty and leadership, self-organising teams seem to reap *a negative* effect.

'*Autonomy*' correlates strongly with two other structure variables: '*leadership*' and '*reward and appraisal*'. An increasing need for autonomy correlates with a decreasing dependency on the manager. Likewise, a strong role from the manager induces an expectancy to be steered. The successful outcome of reward and appraisal policies then depends on the anticipation of these cultural preferences.

Leadership

The respondents share the insight that a steering *leadership* has a negative effect on innovation. It suppresses creativity. Moreover, it demotivates R&D professionals. This can be explained by the low power distance, low uncertainty avoidance and high femininity that characterises the Dutch culture and accounts for the great need for freedom of movement. Dutch professionals prefer coaching with an actual empowerment of the project team by means of a strong decentralisation of authority. Professionals who are used to high power distance experience empowerment and switching roles of leadership as turning things upside down.

Also sensitive to hierarchy, but on a different level, are professionals from the USA. Although having quite a low power distance, the USA attach great value to hierarchy and particularly status. The ASML case shows that in American R&D organisations, hierarchical lines are followed. Americans tend to ask 'who is the boss', before they comply with decisions. In the Anglo-Saxon culture the manager is far more powerful than the manager in the Netherlands. He claims an influential position with regard to payment, reward, opportunities and premiums. This can be brought back to their relatively high score on masculinity and individualism.

Reward & appraisal

Many reward & appraisal strategies and methods applied by the MNCs are based on the Anglo-Saxon culture of work (Shane 1993; Jones/Davis 2000). In an R&D environment these methods pay special attention to instruments like Management-by-Objectives (MbO) and Pay-for-Performance (PfP). These instruments have become widespread although not always in their purest form. Most of the MNCs examined apply mixed forms: partly individual-collective-based performance.

The question is whether these instruments reap the same effect in other cultures where material work aspects only play a minor role in the motivation of R&D professionals (Hoppe 1993).

4.2 An illustrative observation of the masculine, individualistic Anglo-Saxon culture versus the feminine, collectivistic neo-corporatistic European culture

What is the influence of the different cultures on R&D group structure?

Lucent, Shell, Philips and Ericsson illustrate levels of the masculine, individualistic Anglo-Saxon culture to a varying extent. At Lucent the influence of the masculine and individual Anglo-Saxon culture is prevalent. The professionals are strongly managed

on the basis of output. Creativity is rewarded financially. This induces a strong role by the manager.

It reflects the somewhat peculiar relationship between on the one hand the wish for assertiveness and initiative from professionals to take on chances, but on the other hand the preserved control and hierarchy that restricts their freedom of movement (Bailyn 1985).

At *Shell* there is a mixture of the Anglo-Saxon culture and Dutch-European culture. On the one hand, the combination of low uncertainty avoidance, low power distance and femininity that marks the Dutch culture clearly creates a flat R&D organisation with self-managing teams. On the other hand it is striking to observe that the cooperation with American professionals has weakened self-management group structures. The balance was ultimately found in coaching, which resembles a convergence of the two seemingly opposing structures. Yet, the – although consultative – manager still fulfils a strong position in the project and salaries are based on individual performance.

Philips gives free rein to creativity despite the fact that it is highly product and result oriented. Although the R&D organisation is adapted for rapid product development and market introduction, the MNC simultaneously intends to preserve a creative atmosphere in which professionals have the latitude to work out their ideas.

The home country of *Ericsson* is Sweden, known for its high degree of femininity. Ericsson deploys empowerment to stimulate creativity. However, it goes for both Philips and Ericsson that autonomy is predominantly operational, restricted within fixed borders. For the professionals this implies keeping to the agreed activities and not deviating from the main issue. Both companies partly deploy individualistic performance-oriented methods of reward and appraisal.

At some MNCs the Anglo-Saxon influence was less visible and femininity was more manifest. Océ and DSM created openness in their structure in order to arouse effective discussions between R&D professionals. This appeared to make them vulnerable to the relatively reserved behaviour of foreign professionals originating from high uncertainty avoiding and high power distant cultures. The structure is embedded in a culture of low power distance and uncertainty avoidance that stands at right angles to the sensitivity for hierarchy by power distant cultures and the need for security by uncertainty avoiding cultures. In cooperation with its French employees, Océ has decided to integrate the French unit into the Dutch organisation. However, the attempt to organise the French unit's R&D process similar to the Dutch organisation faltered. The resistance came from two sides: the professionals could not get used to the granted autonomy, and the French management could not let relinquish of control. The situation asked for another solution and the MNC was deliberating differentiating that part of the project. Until that time, Océ adapted its R&D organisation to the French standard. DSM also experienced the French professionals' preference to a hierarchical context. In contrast to Océ, DSM had chosen to integrate the foreign input into the organisation, so as to create one organisational unity of R&D efforts. The MNC achieved this by consciously steering on culture. Nevertheless, the situation differs from Océ in the sense that DSM employs many foreign professionals at their Dutch facility, which makes the R&D teams clearly multicultural. The creation of one

organisational culture, featuring the company's norms and values that are mutually shared, needs to decrease differences in national culture. This organisational culture is supposed to adapt foreign professionals to prevailing organisational practices.

4.3 Convergence or divergence of organisation structures

How do MNCs adapt to cultural influence on R&D group structures?

The research proves that organisations have found several ways to bridge the gap between expectations of the organisation and needs of professionals with different cultural backgrounds. These ways vary from separating R&D processes in order to comply with cultural difference (Océ) to creating one organisational culture (DSM). It appears that these MNCs are faced with an organisational dilemma: whether to integrate the foreign unit and consider it to be part of the organisation, or to differentiate their input alike on a subcontracting basis. Comparing the Océ case with the DSM case shows that the adaptation of group structure depends on the nature of foreign cultures' influence.

The collected data from the eight cases seems to confirm our impression that interference of national culture alters the Dutch influence on R&D organisation. First, our data indicates the limitations of exporting the concept of self-organisation to foreign units that feature high power distance and high uncertainty avoidance, pointing to the necessity of adaptations or at least concessions. Second, the converging influence of the masculine Anglo-Saxon culture becomes apparent. On the one hand this strengthens the initiative of professionals via Pay-for-Performance-basis – a method that thus far has only hesitantly been accepted in the Dutch culture up to now – on the other hand it limits the strategic autonomy of professionals by strong managerial influence.

There is more than culture

Two distinctions concerning these conclusions are in place. First, it should not be forgotten that cultural influence is not a constant factor but subject to change, for instance by the applied organisational structures. Second, there are also other internal and external factors exerting influence on the R&D process besides national culture. These three considerations will be examined briefly.

Cultures also change

We found evidence that Dutch R&D organisations adapt their structures so as to create work conditions in which creative behaviour can flourish. Although this indicates a comparatively decreased influence of the Dutch culture on R&D organisations and would therefore suggest a weakening of home country influences, there also are important reverse shifts perceptible that are worth considering. Besides the R&D organisation, the R&D staff also joins the globalisation process. Universal education, exchange programmes and working intensively in international settings render professionals not only accustomed to cultural differences, but also less attached to their countries of origin; they become true cosmopolitans. A Chinese professional having received his or her degree in the United States and now being employed at a Dutch laboratory is no longer an exceptional example. In order words, national culture also changes. Yet, as Snow (1979) observes, culture lasted longer than structure.

External factors: nature of the primary processes, technological development and commercial pressure

The nature and strength of the correlation between culture and structure is interceded by other factors, in particular the kind of production process of and the commercial pressure on R&D work. We found the production process to be one of the context factors that determines the basic research process. This is illustrated by Organon. The discovery, development and production of medicines is a complicated and high-risk process that generally takes many years to complete. The process is pretty standardised and requires well-defined process descriptions that leave little room for freedom of movement and, as a result, task autonomy is low. The power distance between manager and researcher is higher than common to most Dutch organisations, as decisions and choices need to be checked centrally by the management.

Increasing commercial pressure in a complex and uncertain environment has shifted focus of R&D towards useful solutions for business yielding financial results in the short term. There are two different responses: MNCs either oppose it by using hierarchy and strict management in order to make the process manageable (ASML, Organon, Ericsson, Lucent Technologies), or endorse it by letting go of this hierarchy (Océ, DSM, Shell, Philips). The first response often goes hand in hand with restricted autonomy. The second response often involves organisational openness and an aversion to too much structure. Ample attention for the individual's development creates an acceptance of making mistakes, as it is considered to be part of the individual learning process.

It is interesting to observe that similar responses also occurred under the difficult economic conditions of the past years. On the one hand MNCs responded with a tightened control of activities so as to increase efficiency, shorten development-lead times and cut down expenses. Consequently, the professional's freedom of movement became subject to intensifying result orientation. On the other hand, MNCs challenged tight financial conditions and uncertainty by granting even more autonomy to professionals (e.g. DSM). Some MNCs have become aware of the risk of a dominating short-term focus drying up knowledge for future innovations. Shell for instance, has separated business-driven innovations from those driven by ideas from professionals. This stimulates long-term research, which by definition should be ambitious and allowed to be risky.

5. Discussion and conclusion

In this paper we have discussed the influence of national culture on R&D organisational structure in MNCs. Our research question was whether, as a result of globalisation of R&D, one dominant organisational structure is emerging or, conversely, whether the increasing multicultural composition of teams is leading to a greater diversity of organisational structures.

One of the most important implications of this study was the profound operationalisation of the concept 'organisation of R&D processes'. Unravelling the different variables of structure as well as confining the research to the context of the micro level group structures enabled us to generate precise and subtle conclusions.

The study seems to confirm a converging trend of structure in reaction to the growing dominance of the 'Anglo-Saxon' culture of globally-oriented R&D. This cul-

ture is characterised by comparatively low power distance, low uncertainty avoidance and by masculinity. For structure this implies a relatively large internal operational autonomy linked to reward systems that are based on performance, and simultaneously it implies strong leadership with relatively limited external strategic autonomy.

However, the study also indicates that this conclusion needs to be made with care. First, we observed that the influence of the Anglo-Saxon culture is weakened by the cultural context of the home country. Typically Dutch MNCs as Océ and DSM translated the rather feminine Dutch culture into structure-characteristics as consultative leadership styles and self-organising teams. This brings to mind the home-country effects on organisational structure established by Barlett and Ghoshal (1988), which facilitate a continuation of differences. Second, we noticed that foreign professionals who originate from a country other than the United States, for instance France, clearly exert a diverging influence on structure in R&D groups. Third, it appeared that, in addition to culture, there are also other factors that determine the R&D organisational structure, such as developments on the market and in technology. This study has shown that other internal and external factors (technology, nature of the primary process), exert strong influence on the R&D group organisation and as such these have serious consequences for the innovative capacities of MNCs.

These results indicate that an unambiguous answer on the research question does not exist, as converging and diverging forces are in continuous interaction with each other and therefore mutually affect each other. Many of these forces are still evolving and may change their influence at some point.

The study emphasizes the need for a broader understanding of the effect of globalisation on R&D; one that is not limited to the one-dimensional relationship between culture and structure.

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Appendix 1   Facts and figures of the research cases (Offereins 2003)

MNC	Industry	Department	Number of foreign R&D subsidiaries	Size of interna-tional R&D staff	Number of nationalities involved in R&D at Dutch site	Countries of origin
ASML	Semicon-ductor	Development and Engi-neering	5	---- *	3	Germany, the United States, the Nether-lands
DSM	Chemistry	Chemistry & Technology	9	2,000	11	Great Britain, Bel-gium, Germany, Iran, Kenya, Italy, Spain, France, the Nether-lands
Océ	Digital print-ing and document manage-ment	Wide Format Printing Sys-tems	6	2,000	4	France, Belgium, Germany, the Nether-lands
Organon	Pharmacy	Research (drug discov-ery) and de-velopment (compounds)	5	2,700	3	Scotland (Great Brit-ain), France, the Netherlands
Philips	Electronics	Philips Re-search Laboratories (Nat.Lab.)	8	2,500	9	Belgium, Germany, Great Britain, Greece, Russia, Malaysia, Vietnam, the Nether-lands, China
Shell	Chemis-try/raw ma-terials	Shell Tech-nology Explo-ration and Production B.V.	40	25,000	15	Great Britain, Ger-many, France, Nor-way, Eastern Europe (e.g. Poland), Russia, the Netherlands, In-dia, Nigeria, Malaysia, Oman, China, Paki-stan, the United States
Ericsson	Telecom-munications	Application Design	8	20,000	8	Sweden, Serbia, Ro-mania, Mexico, Co-lombia, Iran, the United States, the Netherlands
Lucent Technologies	(Tele) communicat ions/ software	Bell Labs Ad-vanced Technologies	30	30,000	13	Great Britain, Spain, France, Poland, Greece, the United States, China, Yugo-slavia, Morocco, Tur-key, Australia, India, the Netherlands

* exact figures not available

Appendix 2   R&D group structure

	MNCs			
Variables of structure	**ASML**	**DSM**	**Ericsson**	**Lucent Technologies**
Autonomy	decentralized technical decisions; decisions regarding time and budget centralized to management; freedom of movement as long it does not concern these two aspects	decentralized authority; responsibility and accountability low in organisation; risk-taking behaviour is encouraged; try solving problem yourself first, before manager is involved; making mistakes accepted	responsibility and accountability as low in organisation as possible (empowerment); team autonomous within PQT	authority not completely decentralized, final responsibility in hands of project leader; professionals free to take decisions within framework
Leadership	coaching; voicing criticism to manager is allowed; manager's authority can be challenged	coaching and facilitation; flat organisation, small distance between superior and employee; steering is an undesired leadership style; managing at distance requires different leadership style with modern communication instruments	coaching and facilitation; professionals can challenge manager's authority in decisions	coaching; by definition, professionals have more knowledge of specific problems, so they can challenge manager's authority; managing at distance complex, entails different time-zones and cultural differences
Reward & Appraisal	Pay-for-Performance; professionals are assessed on 5 points that form the basis of salary raise	competence management: aimed at development and improvement of professionals; yearly assessed on project targets and personal targets: 1/3 team targets linked to projects, 2/3 individual targets, variable + fixed	yearly evaluation targets and project targets evaluated during course of the project; individual rewards, linked to function; currently introducing a more market conform system	rewards with a fixed and a variable part; the variable part is 50% of individual targets in the form of bonuses, and 50% of team targets

Appendix 2   R&D group structure (continued)

Structuring R&D function at micro level: R&D group	MNCs			
	Océ	**Organon**	**Philips**	**Shell**
Autonomy	decentralized responsibility; teams are self-managing and take on responsibilities; creativity, taking initiative and risks are stimulated; team makes their own agreements with business	MT determines objectives; team has freedom to act within set conditions; needs to account centrally; if team progresses, it is provided with freedom, otherwise managed strictly	authority varies per type of decision: technical decisions by team, the interests of the product divisions are important or even decisive; other decisions by team manager; team needs to try solving problems first, before group leader is involved	self-organizing laboratory, operating units managed; freedom of team depends on manager and part of the organisation; different parts of organisation need different organisational models
Leadership	coaching; small distance between superior and professionals; management-by-walking-around; pro-active instead of controlling afterwards; few permanent functions; project leader and coach may return to team again	coaching; being steered is not accepted; coordination by small group of 6-8 persons; frequent discussions on project direction with project leader; internationalisation requires different approach manager: managing at distance by means of modern communication instruments	coaching; leader does not always know more than professionals; need to be able to admit and prevent competition; project leader has same status as project member; functions change regularly; showing attention is important; internationalisation changes management and requires visits, telephone-conferencing, e-mail	coaching; difficult way of managing: if you do it well, the results will improve; at specific moments leaders are assessed and criticized; professionals allowed to question authority of leader in certain decisions
Reward & Appraisal	individual rewards; end-of-year functional salary appraisal; six months later an appraisal for personal and professional development in the long term	a combination of fixed and variable rewards; the variable part is based on the performance of the unit or department and based on the individual performance rewarded by bonuses	Pay-for-Performance: ¼ individual and ¾ collective (laboratory inventions, publications) reward; career based on self-criticism, bonus for four additional projects; rewards partly based on tenure	Pay-for-Performance; salary raise based on individual performance; bonus and stock options for individual performance, value depends on that of organisation as a whole; internationalisation complicates contract of individual employee

Appendix 3 An example case study of the influence of national culture on R&D: group structure Philips

Cultural dimensions	Variables of structure							
	Auto-nomy		**Decision-making**	*value dim.*	**Leadership**	*value dim.*	**Reward & appraisal**	*value dim.*
PDI			- not expressing opinion during meeting unless asked for (Japan);	↑PDI	- sensitivity to hier-archy (Germany); - easily accepting decisions made by leader (Germany); - easily questioning leader's authority (Netherlands); - difficulty question-ing authority leader (foreign employees)	↑PDI ↑PDI ?PDI ↑PDI	- difficulty in judg-ing organisation and themselves (Asia, Belgium); - expect appraisal to be conducted by manager (Bel-gium);	↑PDI, ↑UAI ↑PDI
UAI	- need for clear goals (China); - prefer-ence to work with de-tailed planning (China);	↑UAI ↑UAI						
Coll/Ind	- impor-tance is attached to show-ing ini-tiative (USA)	ind	- it takes a long time to reach a decision accept-able to everyone (Japan); - refraining from expressing indi-vidual opinion (Japan); - showing initia-tive during meet-ing is appreciated (USA);	coll coll ind			- difficulty in dis-cussing perform-ance openly (Asian); - value is attached to agreements, which are consid-ered contracts (USA); - only being as-sessed on activi-ties they have un-der control (Neth-erlands);	coll ind, mas ind
Mas/Fem					- manager's expec-tations of foreign employees are very Dutch	fem	- importance is at-tached to ap-praisal, especially to the competitive element (Great Britain); - performance is more important than process (Great Britain);	mas, ind mas

Legend:

PDI: The Power Distance Index   UAI: The Uncertainty Avoidance Index

Coll/Ind: Collectivism versus individualism   Mas/Fem: Masculinity versus femininity

↑: high value of dimension

↓: low value of dimension