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THE ARICON VE READINESS ASSESSMENT APPROACH IN THE NEW PRODUCT DEVELOPMENT (NPD) CONTEXT

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The challenge for industrial companies is to demonstrate their capability to enter a VE cooperative scenario on a "plug-and-play" basis. There is a need to establish a common and recognised methodology and tools in order to evaluate and qualify companies as far as their cooperation readiness is concerned. The ARICON project aims at defining a cooperation readiness assessment methodology and tools, suitable for identifying companies who are capable of effective cooperation before they enter VEs. The ARICON methodology is being tested in a number of actual business cases, representing different typologies of Virtual Enterprises (peer-to-peer VE, enhanced value chain VE, project conduction VE etc.) as well as in different industrial sectors (aerospace, automotive, food, construction and environment). An overview of the ARICON assessment methodology is reported in the paper.

1. INTRODUCTION

The emergence of the so-called digital and knowledge economy has had significant impact on the way firms design and develop new products. Nowadays more and more firms are entering into trading alliances (Virtual Enterprises, VE) with their collaborators during the course of the New Product Development (NPD) process, so as to enhance their efficiency and competitiveness in the rapidly changing and dynamic global environment. Thus the challenge for industrial companies is to demonstrate their capability to enter the VE cooperative scenario on a "plug-and-play" basis. There is, however, a need for establishing a common and recognised methodology and tools in order to evaluate and qualify companies as far as their cooperation ability and attitude are concerned.

The ARICON project aims at defining a cooperation readiness assessment methodology and tools, suitable for identifying companies who are actually capable of starting effective cooperative schemes before they enter VEs. The ARICON readiness assessment for VE cooperation evaluates all of the aspects relevant to VE cooperation (business models, legal, human, organisation and process, innovation/ technology and ICT). The model is characterised by two different levels of assessment:

- Internal readiness assessment of a company, to ascertain their ability to enter a generic VE environment (among the typologies already identified in the current technical literature);
- Interoperability readiness assessment, to evaluate that a specific VE team is actually in a position to run the cooperation effectively.

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2. ARICON VE MODEL

It is worth noting at the outset that the task of identifying VE models is made difficult by the complexity of the notion of a VE itself. Researchers in the area of VE's have offered a variety of definitions intended to capture this new organisational form (e.g. Tolle et al., 2000; Mazzeschi, 2001; Santoro and Conte, 2002; Edelmann et al., 2003). Beyond the consolidated definition of VE as a group of companies geographically dispersed working on common projects and/or products, as if they are one company, common concepts implied in the VE framework and used by researchers include: Temporality, Innovation, Pro-active, dynamic attitude towards business, Resources/capacity sharing, Risks/revenues sharing.

Common concepts are reported and integrated in Figure 1. The challenge of Aricon is to develop an assessment which assesses all of these dimensions.

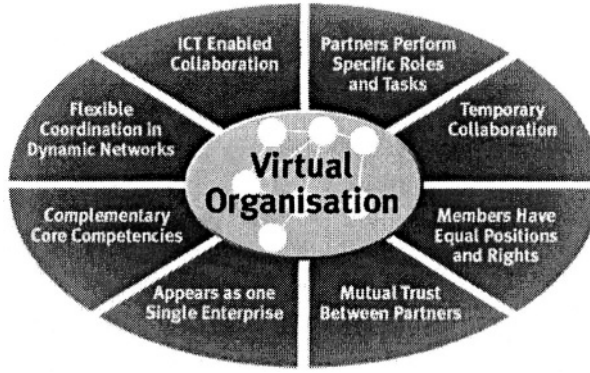

Figure 1 – Overall attributes for Virtual Organisations

3. READINESS ASSESSMENT – STATE OF THE ART

The state of the art of readiness assessment within the NPD domain has made steady progress over the last decade. The principal driver of this progress has been concurrent engineering (CE) and the need to assess readiness for CE. The American RACE project was the most comprehensive definition of a readiness assessment method for CE (CERC 1993, De Graaf 1996). This was further refined by the EU projects PACE (which developed a conceptual model of CE) and CEPRA (which

implemented a readiness assessment tool - and successfully applied it to SMEs in the aerospace sector). However, this work has only considered product design within an enterprise. The model of CE has yet to be applied to the virtual enterprise.

IBM and the DMU-BP EU project have developed a maturity model and assessment model for new product design within the enterprise (Matheson, 2001). However, there is a further level of maturity that was not taken into account by the model – integration within the virtual enterprise context. There are a number of approaches and tools available for product development assessment, most of which are offered as commercial services by consultants (eg. DRM Associates - PDBPA, Product Development Institute (PDI), Sopheon - ProBE). The Sopheon/PDI offering is a process benchmarking and evaluation (ProBE) tool (www.sopheon.com). This tool was developed by Robert Cooper and Scott Edgett of PDI, internationally recognized authorities on new product management, famous for the renowned Stage-Gate system. ProBE identifies companies' strengths and weaknesses of their existing NPD process by benchmarking it against the processes of the best 20 percent of companies with successful new product development track records. DRM Associates' Product Development Best Practices and Assessment (PDBPA) software describes 250 best practices identified from researching and examining many companies' product development practices from around the world. The PDBPA provides a structured benchmarking and assessment methodology for the product development process based on best practices.

The NIMCube EU project sought to develop a holistic reference methodology for new-use and innovation management and measurement for European R&D industries, including the development of a generally valid assessment methodology to provide a means for companies to rate and improve their new-use and innovation readiness and competence. The project will provide methods and IT-solutions for measuring, managing and optimising re-use of knowledge and innovation. An assessment methodology (NIMrate) will be developed for evaluating and improving innovation performance as well as a measurement methodology to optimise the balance between new-use and innovation. NIMCube does address the context of "a highly dynamic, distributed, mulit-cultural user environment". However, its focus on re-use of innovations (designs) and knowledge limits its applicability to a partial coverage of the new product development process.

The Software Engineering Institute, the founder's of Capability Maturity Models (CMM), has published a maturity model for integrated product and process development (www.sei.cmu.edu). This defines the following areas: requirements management, project planning, project monitoring and control, supplier agreement management, measurement and analysis, process and product quality assurance, and configuration management. Examining the supplier agreement area it is primarily designed to deal with the purchase of existing products or services, that is, it does not detail the process of design in collaboration with suppliers – thus missing virtual enterprise.

To conclude the review of product development assessment methods and tools it can be seen that there is no mention of virtual enterprise in any of these tools, in the conceptual approach, or in details of the tools themselves. The closest they get is to include some assessments of 'supplier integration'.

A web search on benchmarking was carried out to see if benchmarking would cover virtual enterprise. A number of sites offer to benchmark companies online –

for a fee (eg. www.balancedscorecard.com, Benchmarking Exchange – www.benchnet.com, the Performance Measurement Group - www.pmgbenchmarking.com, etc). A good many of these are based on the Balanced Scorecard method and most are available online on the web. Simpel's software leans towards organization and human aspects (www.simpel.com). Yet there is an absence of virtual enterprising in the description, purpose and implementation of the benchmarking various tools.

So to conclude this review of the state of the art, benchmarking especially, but even product development assessment have reached a high level of maturity in terms of commercial services – there are consultancy and online assessments for both benchmarking and product development assessment. The key ingredient which they all miss, however, is the contemporary context of virtual enterprise and new product development, none of the assessment or benchmarking tools surveyed included virtual enterprise as a concept – and certainly not as part of the assessment.

The ARICON project will explicitly address this missing consideration of virtual enterprise. This will require the development of a maturity model of NPD in the virtual enterprise. Once this has been developed the assessment methods and techniques necessary to determine capability and readiness will be developed. These will then be turned into a user-friendly web-based tool for assessing readiness. Of course the American approaches do not address the European VE situation of a multicultural and multilingual context, so ARICON will greatly aid European industry in this key competitive industrial configuration.

4. ARICON VE READINESS ASSESSMENT

ARICON aims at integrating all the findings and results achieved in previous European funded projects and in other outstanding initiatives, with the innovative objective of deriving a model and concepts to establish the readiness level of potential partners, willing to join Virtual Enterprises. There are a number of existing works and projects dealing with the broader issue of identifying those parameters that jointly constitute a conceptual framework within which any investigation of VE readiness can be usefully located. A non-exhaustive list of such initiatives is: Globemen, Free, Enhance, Cepra, Vive, Active, Alive, Voster & Bidsaver.

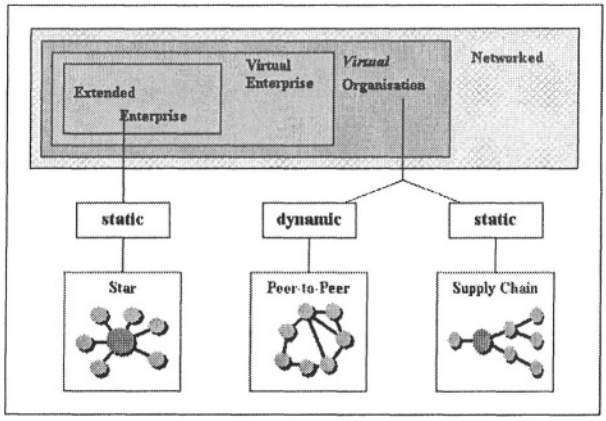

Figure 2 – Different models of virtual cooperation considered in ARICON

The approach adopted within ARICON for building the assessment model is based on the experimental evidence collected and built upon a number of actual, on-going business cases. This data collection has shown that, up to now, operative examples of VEs exist only according to specific business models (see Figure 2) and only in specific industrial sectors.

The ARICON assessment methodology is being developed according to such specific business models and industry sectors in order to match the assessment concepts with operative, currently working scenarios. The methodology structure is also intended to be modular, i.e. suitable to accommodate additional business models and industrial sectors during and after Aricon development activities.

- The overall assessment process which is being tested in the different pilot cases is summarised in the following diagram (Figure 3).

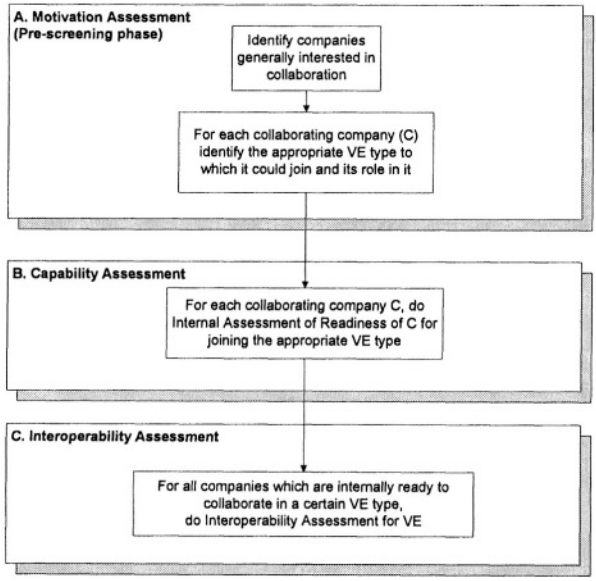

Figure 3 – The ARICON assessment process

The purpose of the assessment is to determine whether a company can be qualified to enter a particular VE model in a specific industrial sector. Alternatively, if the company is not ready to collaborate, the assessment model will provide a change implementation plan, thus helping that company to pass the readiness assessment evaluation.

The assessment consists of 3 main stages:

A. Motivation assessment

In this stage, companies generally interested in collaboration are identified, along with the appropriate VE model to which they can join.

B. Capability assessment

Each company interested in collaboration is assessed in terms of its internal readiness for a particular VE model.

C. Interoperability assessment

All the companies identified in the previous stage as "Ready to collaborate" and interested to form a consortium for a particular VE opportunity, are now assessed in terms of their interoperability. The purpose is to arrive at a valid and operable VE consortium.

5. ARICON ASSESSMENT TOOL OVERVIEW

The ARICON assessment tool is a software module for interactively assessing a company with respect to its readiness for collaboration and for interactively assessing a consortium of companies with respect to its interoperability as a Virtual Enterprise. The tool has 2 main components (Figure 4): 1. ARICON Assessment Tool; and 2. ARICON Certification Repository.

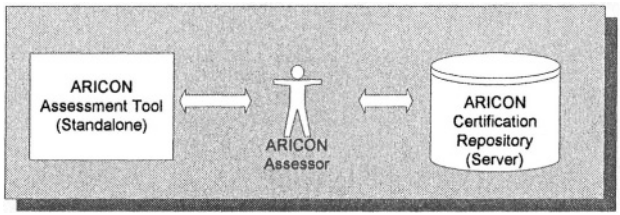

Figure 4 – ARICON Assessment Tool Components

The **ARICON Assessment Tool** is a standalone software application containing assessment questionnaires and will be accessed by an ARICON Assessor only (that is, there is no self-assessment possibility).

The ARICON tool will guide the assessor in the selection of the questionnaires and on the identification of the potential gap in collaboration, based on a minimal set of criteria. However, the assessment task will rely to a greater extent on the assessor's judgment and to a lesser extent on the reasoning embedded in the assessment tool. Therefore the assessor will have to be qualified and certified as an ARICON Assessor, in order to ensure that he is able to carry out tasks like:

a. identify the VE model to which a company or consortium belongs and to select the appropriate questionnaires
b. collect company information and use the questionnaires
c. estimate the collaboration gap and develop the appropriate recovery plan

The **ARICON Certification Repository** (Figure 5) is a repository of:

- Internal readiness assessment results
- Interoperability assessment results
- Certified companies
- Certified VE consortiums
- User companies
- Assessors.

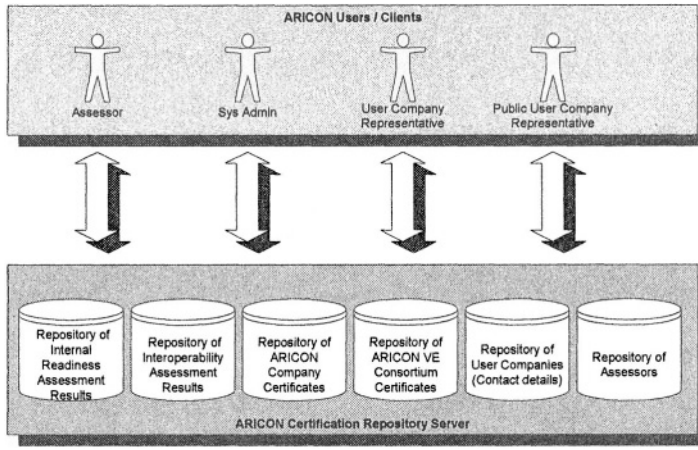

Figure 5 – The ARICON Certification Repository

4.1 ARICON VE Assessment Modules

The tool will address the following assessment areas: 1) Business Models and Strategy, 2) Organisation and processes, 3) Human issues, 4) Technology & Innovation, 5) ICT and 6) Legal issues. For each area the tool will contain an assessment questionnaire. This questionnaire will be divided into a number of modules, shown in Table 1:

Table 1 – ARICON Internal Readiness Questionnaire Structure

General Readiness Questions	General questions
Generic (Internal) Readiness Questions	The main body of questions assessing readiness.
VE Specific Readiness Questions	Questions specific for the different VE models.
Industry Specific Questions	Questions specific to different industries.

A screen shot of the prototype Aricon assessment tool for the ICT area is shown in Figure 6.

5. CONCLUSION

Today's business models, processes and assessment tools do not tend to mention or include the Virtual Enterprise dimension. Increasingly, due to the continuing globalisation of large enterprises and their need to be a part of a Virtual Enterprise, Partnership or Joint Venture to deliver an effective service to their customer, small enterprises, unless they take similar steps, will go put of business. SMEs need to, and indeed are, starting to collaborate with their peers to deliver a complementary service to large enterprises. Hence the ARICON assessment methodology, covering Business Strategy and Business Models, Organisational Models and Process Models, Human aspects, ICT Infrastructure, Innovation and Technology for VE as well as Legal aspects, is urgently required to fill this gap in the market.

The initial ARICON assessment model is intended to be validated in a number of actual industrial pilot scenarios, which will provide an adequate test bed and validation for the developed assessment model.

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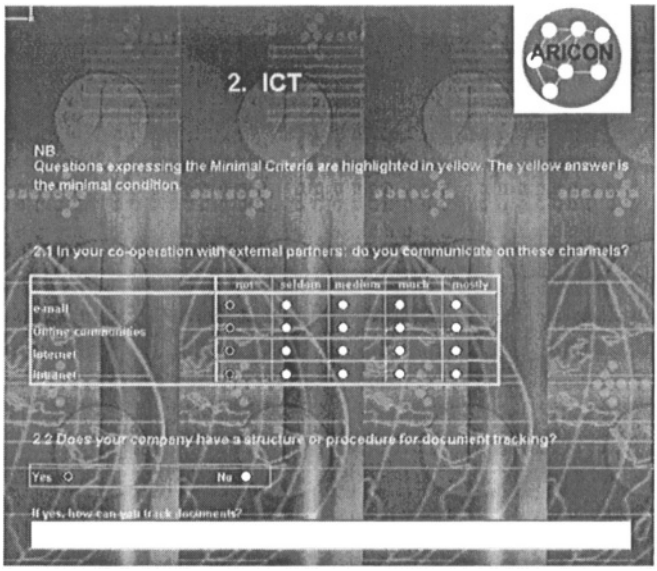

Figure 6 – Screenshot of ARICON Assessment Tool – ICT Area

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