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## **INFORMATION TECHNOLOGY IN INTEGRATED FARMING**

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[ABSTRACT](#)  
[INTRODUCTION](#)  
[NETWORK ORGANISATIONS](#)  
[MANAGEMENT TECHNIQUES AND ROLE OF VIRTUAL ENTERPRISES IN AGRIBUSINESS](#)  
[AGRO-VI@](#)  
[CONCLUSIONS](#)  
[REFERENCES](#)

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### **ABSTRACT**

Information is basic and essential element of every human's activity and has incredibly important role in every sphere of life. This word hides many meanings. Information is the data as well as knowledge used during decision taking process. That is also whole range of interpersonal communication and news involved in sorting out the problems.

One of the most crucial aspect of the co-operation is ability to exchange business and product data in real time. The second important element is communication, that before internet revolution was difficult when we consider co-operation between partners located in different part of the world.

This way of co-operation is relatively new, it is invention of last decade and it seems to be more and more popular in coming century and is called Virtual Organisation. Thus it is interesting to look closer to this kind of organisation and to connected aspect of information and communication flow among this type of co-operation.

The article is addressed to all those who are interested in supply chain relations, development of co-operation strategies and influence of information and communication technology on economy and agribusiness.

**Key words:** virtual organisation, virtual enterprise, information, communication, management techniques, strategic alliances, planet-satellite organisation, AGRO-VI@

## INTRODUCTION

Among many new publications in the literature we more often see a statement, that world urban civilisation is going to the end and we are approaching now new era – era of information. Information is playing the main role in politics, economy and culture. And what is more – this role increases!

This is very important issue because according to the European Union estimates 60% of the working population deals with information technology and communication. Following that, exchange of services and development of communication tools become main and most important trade aspects.

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When we have a look at any company (enterprise), we will see that information is the core element and the basis of organisation. Characteristic issue is variety of used information, that can be split into flowing into the company and flowing out of it, integrating management work and compact activity.

In order to meet its functions, enterprise needs diversity of information, like macroeconomic that applies to the company as the whole organism, but also every single element that builds this body.

In the first group we will find information regarding state intervention, taxes, customs duty on the commodities, prices, law regulations, etc.

The second group contains data about sale possibilities of own products or services, competitors, suppliers and customers, technical and technological development.

As the last to list can be information regarding organisational cells: labour and machinery time usage, salaries etc.

So whichever subject we would like to touch we see need of information, necessity of collecting the data in order to built valuable base for future usage. Something that we have to bear in mind: decisions can only ever be as good as the information on which they are based, using simple words: rubbish in – rubbish out.

Since the beginning of recent decade we have been witnesses of several new social processes which have significant impact on economy. The most important of those processes are:

- Globalisation of economy
- Development of pro-ecological awareness
- Internet revolution
- Reinforcement of consumer position in chain of supply

All these factors have created new requirement for those enterprises, which want to obtain success. The requirements are:

- Boundary crossing
- Efficiency
- Usage of competitive advantages
- Specialisation
- Need for high quality and pro-ecological products
- Usage of ICT
- Flexibility

For a single small or medium enterprise it is impossible to meet the requirement. The entire requirement can be met in kind of co-operation. However it should be total co-operation. The co-operation can not be delimited only to relations with suppliers and clients but each element of the co-operation must have links to any other element of the organisation. Information connected with the product, which is made by the organisation, should be easy available for all elements of the co-operation. In these kind of co-operation independent companies despite of concentrating on its core competencies can act flexible, efficient and care about quality.

## NETWORK ORGANISATIONS

Network organisations are one of the types of co-operation between companies. Three main sub-groups can be distinguished:

- Planet - satellite organisations
- Strategic Alliances
- Virtual Enterprises

### **Planet - satellite organisation**

Planet - satellite organisation can be characterised as organisation with one dominant member (sometimes called planet) and few other members (satellites) closely linked to the dominator and usually being its suppliers. Dominator has to certain extent influence on its satellites, which allow him to decrease uncertainty about for example continuity of supplies. On the other hand suppliers as long as obey rules set by the dominant company do not have to worry about sale. Dominant company also can impose to other members of the organisation its communication solutions and software standards. These factors decide that in comparison with "traditional" organisations Planet-Satellite model allow for better process optimisation, considerable cost reduction and significant risk decrease. Classic example of such model is Japanese motor industry where many subcontractors surround dominant motor company.

Planet - satellite organisation can be characterised as organisation with the greatest level of control (from planet point of view) and with the lowest uncertainty. The dominant company determines what, how, where and in what amount should be delivered. Dependence of supplier from the large company is sometimes so strong that it seems that the supplier is only a department of "planet" company whereas it can be fully independent entity. The planet does not depend on its satellites and in case of not satisfactory co-operation another can usually replace a satellite company. Satellites are very specialised which make them very difficult to integrate and become a planet. Uncertainty in planet-satellite organisation is low. Uncertainty is usually an effect of lack of information and in this structure all arrangements also about procedure of sharing information are written down in contracts.

### **Strategic Alliances**

In Strategic Alliances there is no company with that can have control over other members of the organisation. This has an impact on increase of uncertainty of the company members. In this kind of relations it is much more difficult then in case of Planet-Satellite Organisation to worked out commonly accepted communication solution or to impose other members of alliance to use one kind of software. Very often is such alliances co-operation between companies is limited to certain activities. Strategic Alliances are something more the just outsourcing. As a example of this kind of organisation can be considered any type of Joint Venture.

Strategic alliance control is reduced and there is greater uncertainty then in the case of planet-satellite organisations. In strategic alliances partners co-operate on delimited activities and on this field their control is limited to the extended of control of the other party of parties of the alliance. There are some arrangements and pre-agreed procedures of co-operation in strategic alliances but the success in this type of organisation depends more on reciprocal relations then in case of planet-satellite organisations. Strategic alliances are more flexible structure then planet-satellite and therefore it can be easier adjusted for changing environment and because of closed structure and limited number of participants risk can be also kept on low level. However in case of some situations that needs variable number of participants or in case of fast environment changes or short time demand virtual enterprises are better solution.

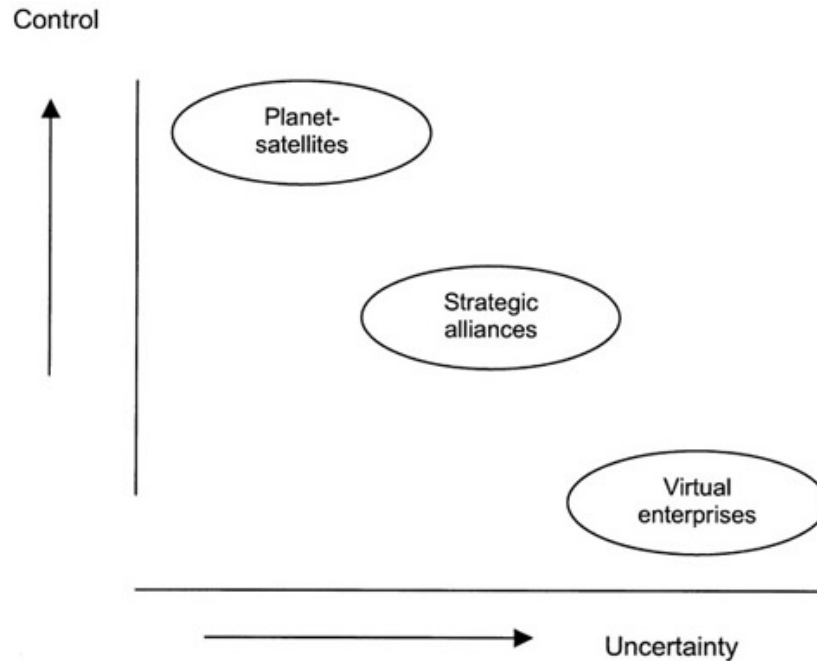
### **Virtual Enterprises**

The newest kind of network organisation is Virtual Enterprise. This is the most "democratic" structure of existing nowadays organisation where there is not only equality of partners but also it is relatively easy to become a member of the structure as well as quite from the structure. Sharing knowledge, skill and exchange of dates in real time are essential components of co-operation in Virtual Enterprises. To make it work usage of information and communication technology is needed. Thank to this factors this type of network organisation is very creative, and innovative. As Virtual Enterprises is quite new issue still there are many problems to be solved to implement it on the large scale. Following chapters will try to explain what exactly is Virtual Enterprise, what are the advantages of the system of co-operation, present common problems that can be met during implementation of the model and find solutions for some of them. Among virtual enterprises control and

uncertainty are decentralised, and the level of risk depends mainly on trust and information flow. Flexible structure, dependence on informal and personal relations and dependence on information sharing makes virtual enterprises the best solution for projects with disperse information.

The schematic distribution of control and uncertainty in the three network organisations is presented in the [Figure 1](#).

**Figure 1. Control and uncertainty in network organisations (Sieber)**



### **Characteristic of Virtual Organisations**

Conception of Virtual Organisations or Virtual Enterprises is relatively new one thus there is still no one commonly accepted definition. More over there is lively discussion on this issue ongoing especially on Votalk a news group at:

*<http://www.virtual-organization.net>*

The most interesting definitions and approaches present on the news group are as follows:

- "A virtual organisation is a temporary network of independent institutions, businesses or specialised individuals, who work together in a spontaneous fashion by way of information and communication technology, in order to gain an extant competitive edge." They integrate vertically, unify their core-competencies and function as one organisation (or organisational unit)." (Fuehrer, Votalk, 1997)
- "An identifiable group of people or organisations who's use of ICT is substantially greater, thereby reducing the necessity of their physical presence for the transaction of business or for doing work collaboratively in order to realise common objectives". (Hill, Votalk, 1997)
- "VO's (virtual organisations), refers to a new organisational form characterised by a temporary or permanent collection of geographically dispersed individuals, groups or organisation departments not belonging to the same organisation - or entire organisations, that are dependent on electronic communication for carrying out their production process." (Travica, 1997)
- "The virtual organisation is a dynamic alliance between organisations that bring in complementary competencies and resources and that are collectively available to each other, with the objective of delivering a product or service to the market as a collective." (Ten Have amongst others., 1997)

Some other definiton of the same idea are presented and used in National Industrial Information Infrastructure Protocols (NIIP) project papers:

- "A Virtual Enterprise is a temporary consortium or alliance of companies formed to share costs and skills and exploit fast-changing market opportunities" [NIIP, 96].

- "Virtual Corporation is a temporary network of independent companies - suppliers, customers, even rivals - linked by information technology (IT) to share skills, costs and access to one another's markets. It will have neither central office nor organisation chart. It will have no hierarchy, no vertical integration". [Byrne, 93]
- "The Virtual Enterprise consists of a series of co-operating 'nodes' of core competence which form into a supply chain in order to address a specific opportunity in the market place"[Walton and Whicker, 96].

All these more or less complicated definitions lead to few common and simple characteristic points:

- boundary crossing
- complementary core competencies/the pooling of resources
- geographical dispersion
- changing participants
- participant equality
- electronic communication

Before more specific information regarding the points will be given it seems to be necessary to explain what is the difference between Virtual Organisations and Virtual Enterprises. Virtual Enterprise more often is used for commercial undertakings and Virtual Organisation can be used to define way of co-operation between universities, scientist, or participants of a project as well as for commercial ventures. The relation between Virtual Organisations and Virtual Enterprises is shown on the [Figure 2](#). Another phrase very often used when taking about virtual organisations and virtual enterprises is virtual web. Virtual web is group of companies or institutions that are willing and able to create or join to virtual organisations.

**Figure 2. The relation between Virtual Organisations (VO) and Virtual Enterprises (VE) (Sieber)**



## **MANAGEMENT TECHNIQUES AND ROLE OF VIRTUAL ENTERPRISES IN AGRIBUSINESS**

*'The most valuable farm input is information'*

Historically, in the food industry, clear boundaries exist between the responsibilities of each of the links in the supply-chain. Suppliers of raw materials were responsible for delivering these materials to the food processors. Food processors then organised and managed the delivery of finished products to the retailers' warehouses. The retailers in turn moved the products from their distribution centres to the supermarkets and stores. Today, the main boundaries of these operations are beginning to break down.

The food industry has consumers and customers who no longer expect to be faced with a trade-off between price and service quality. Retailers have to respond to market demands by cutting the costs out of their own internal operations, in order to support greater expenditure on customer service initiatives and lower prices. Activities which were previously of little interest to the retailers such as, inventory status and costs, suppliers production plans, warehousing, information transfer, quality management etc. are now becoming desired information, in order to drive the final product costs down. The food industry primarily consists of the small and medium size enterprises that tend to function independently with a weak capital base. However, the speed of change in both local and global market parameters, and the complexity of its elements force these enterprises to take bigger and faster steps towards lean, agile, and cost effective production. Furthermore, on one hand, the constant changes in product and process technologies, and on the other hand, the increasing pressure for healthier, more nutritious and organic products, and the environmentally benign production systems with emphasis on waste reduction and energy management enhance this challenge.

The concept of VE for the food industry is relatively new. In theory, by working more closely together and setting aside adversarial relationships, both suppliers and food processors should achieve their ultimate goals of meeting customer's expectations at a lower cost. The virtual enterprise calls for the sharing of skills and information. For this purpose, a two-way communication and exchange of relevant and necessary information must be set up between related partners in the supply chain. A part of the information also needs to be integrated for the virtual enterprise community. Not only do the partners need to ensure the compatibility of the hardware and software within their own organisation, but they also need to ensure compatibility with the technology of their trading partners.

Information technology has enabled retailers to make significant strides in eradicating many basic problems within their supply chains. The virtual enterprises using IT however, will allow partners to have accurate and timely fulfilled orders and commitments. The use of EDI in the Virtual Enterprise will reduce the administration error rates and speed up the processes, which cause the products to flow more smoothly through the system. Technology in the virtual enterprise is needed along every part of the supply chain, from the supermarket to the warehouse to the processing plant itself. The key to a successful supply chain is the ability to integrate these technologies, and the virtual enterprise provides the means.

In the current situation, lots of efforts are spent on the terminal links of the supply chain, i.e., the links between retailers and supermarkets, or even the end users (through the electronic commerce). But, little has been done on the beginning of the chain between the suppliers and processors of raw material. In terms of the economical and financial contexts, some strategic benefits for enterprises that join a virtual enterprise include:

- Better Decision – Effectiveness in operations
- Reduced Delivery Time-to-Market
- Streamlined Production – Using automation to shorten lead times
- Greater Market share
- Increased Sales
- Faster Response – Time in operations
- Higher Returns
- Leading-Edge Technologies
- Cost Effective Solutions – Quality Products at competitive prices
- Global Resources – Partnerships almost anywhere in the world.

Furthermore, the implantation of a networked infrastructure may bring complementary benefits to the network members, namely to farmers in terms of access to specialised information / advice:

- Information / Training on pest-control (Integrated Pest Management – IPM).
- Advice on crops production, Access to market information Industrial context, Market opportunities, and Potential industrial impact.

### **Threats from the net!**

- Increased % market involved in e-procurement and e-selling
- Increased competition providing good technical data to farmers eroding value of traditional services
- Partnerships between manufacturers and dot.coms and distributors to exploit market

### **AGRO-VI@**

AGRO-VI@ is European and Latin American project, which aims to design and develop an open platform and adequate information technologies, tools, protocols and mechanisms to support the virtual enterprise (VE) concept in agribusiness. The platform has been created in close co-operation with other project team involved in creating other virtual enterprise platform namely PRODNET II. As the AGRO-VI@ and PRODNET II project teams co-operate very closely architecture of these platform is similar.

The AGRO-VI@ project sees the virtual enterprise concept as providing the end-users with the technological solutions for their problems in order to increase the possibility to run their business better, faster, and far less costly than their competition. It is evident that for a company to participate in a VE in the food sector, a minimal computational infrastructure must be available. Internet is anticipated as the most cost effective supporting infrastructure.

During construction process of the platform such need like listed below were taken into consideration:

- The need for a platform dealing with openness property
- The need for advanced emergent concepts able to improve the agribusiness competitiveness such as that postulate by the VE approach
- The need to integrate all members composing the food supply-chain

The AGRO-VI@ platform consists of:

- **Orders Data Exchange** supported by Internet (HTML/Java) and related standard for information exchange like EDIFACT.
- **Electronic Commerce.** This module includes Electronic Catalogue, Electronic Market and search for partners' service.
- **Logistic support.** includes Forecasting, Route planning and Product track monitoring
- **Agribusiness broker.** Farmers need to have a simplified and well organized access to information / advice on crops production, Integrated Pest Management (IPM), weather forecast, etc. Another example of shared information that needs to be accessed is the market data. For instance, in the agribusiness sector it is important to have access to worldwide statistics and forecasts on crops production. Several sources of such information are already available on Internet but difficult to find and to use by non-experts. An Information Broker that contacts the expert information service provider, such as in IPM consulting service that gives advice on usage of fertilizers based on the soil and product information, and provide transparent access to this remote information for the users.
- **Communication Management.** Facilities which support confidentiality of internal module of each node e.g. firewalls, check points etc.
- **Advance co-ordination.** The platform includes VE Supervision, Decision Support Systems and VE Analysis.

### CONCLUSIONS

1. E-commerce saves a lot of paper work and time, decreasing costs.
2. Data Management Systems enable the accurate and fast monitoring of produce and producers. Monitor produces movements through every single chain link to see at a glance what is where. Then that enables to get full traceability from planting to point of sale, that is exactly the value market is looking for (**crop assurance!**).
3. Data Manager is an **incredibly powerful decision tool!** Thanks to the data stored in it is possible to get the whole range of reports filtering and specifying particular data depending on currently required information. That saves huge amount of time and manual work!
4. Collecting the data from countrywide creates valuable database. Having such a immense information bank gives possibly additional source of income: **information trade!**

### REFERENCES

1. Browne J., Sackett P.J., Wortmann J.C., 1994. The system of manufacturing: A prospective study, Report to the DG XII of the CEC.
2. Walton J., Whicker L., 1996. Virtual Enterprise: Myth & Reality, J. Control, Oct 1996.
3. Sieber P., Griese J., 1998. Organizational Virtualness, Proceeding of VoNet Workshop, Simova Verlag Bern.
4. Sieber P., Griese J., 1999. Organizational Virtualness and Electronic commerce, Proceeding of VoNet 2nd Workshop, Simova Verlag Bern.
5. <http://www.virtual-organization.net>

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