ELECTRONIC COMMERCE IN AGRICULTURE AND AGRIBUSINESS: THE CASE OF EMILIA ROMAGNA (ITALY)

***Maurizio Canavari - Daniela Miniucchi - Giuseppe Nocella - Davide Viaggi*[1]**
nocella@foodsci.unibo.it
Alma Mater Studiorum - Università di Bologna

Abstract:

Despite the expectations of the benefits of this tool, the adoption of Electronic Commerce (EC) by small and medium firms of the agro-food sector in Italy is still not frequent, however, the understanding of opportunities it could create and how they can be exploited remains a relevant issue.

This study, carried out in the Emilia-Romagna region during 2002, illustrates the results of a survey of 208 firms at all stages of the agro-food chain aimed at understanding the use of the Internet and the strategies adopted for EC implementation.

The results show a low level of implementation of the instrument and a limited variety of adoption strategies. Agro-food firms actually invest very little in EC focusing their efforts on the Internet as promotion tool, while web-based direct selling is confined to market niches. The view that the Internet would reverse the disadvantages of small firms appears by now non realistic, even if interesting opportunities for further development are still present.

1. Introduction and objectives

Electronic Commerce (EC) can be considered a major pathway for future strategies related to marketing and efficiency improvement in the agri-food chain. Nevertheless, the adoption of EC by small and medium firms in this sector in Italy is still not frequent, in particular if it is compared with the expectations of the benefits of such instrument.

After the disillusion on the performances of the so called "new economy", it is even more relevant to try to understand what the realistic opportunities brought about by EC are, and how they can be exploited. In this sense, a higher understanding of the factors affecting the spread of EC in business organisations is required in order to devise strategies able to allow the exploitation of existing opportunites.

In Emilia-Romagna (Northern Italy), only about 3, 000 agricultural firms have access to the Internet (less than 3%) and only 770 (about 0, 7%) connect on a regular basis (ISTAT, 2000). Similarly to other areas in the world, the adoption of the Internet technology in the region is still limited in spite of existing public incentives (Kuhlmann and Brodersen, 2001; Prati, 2002; Sarracco, 2002).

This study illustrates the results of a survey among agriculture and agribusiness firms, aimed at understanding the EC implementation level and its motivations, features and strategies, together with expectations about its future development and the successful strategies followed by EC adopters. The survey was carried out in Emilia-Romagna during 2002 and was based on an analysis of a sample of web sites.

The paper is organised as follows: some theoretical background is given in section 2, followed, in section 3, by a description of the methodology. Section 4 illustrates the results, followed by a brief discussion in section 5.

[1] Maurizio Canavari: sections 3 and 5, Daniela Miniucchi: data collection, Giuseppe Nocella:section 4, Davide Viaggi: sections 1 and 2.

2. Theoretical background

While internet has reached a major significance in terms of economic and technological attention, a comprehensive economic framework for the interpretation of the phenomenon is not yet available. While some theories have drawn from almost philosophical concepts in order to advocate that Internet has been a real revolution subverting economic laws, economic theory has tried to provide positive models of EC which build on existing categories and experiences. The recent literature shows a more operative approach, with the development of new, *ad hoc* frameworks of analysis.

A summary of the main theoretical approaches that can be applied to electronic networks, including EC, is provided by Holland e Lockett (1997), who list the following approaches:

- economic analysis;
- strategic behaviour;
- industrial marketing
- organisational behaviour.

The first approach, based on economic theory, tends to deal with electronic markets through the transaction costs approach: EC could reduce transaction costs into markets and other forms of interaction among economic actors, and that should generate a reduction of production costs. In addition, an impact on the food chain organisation is expected. The benefits of EC should be then more relevant for areas of the food chain dominated by market transactions instead of by contracts or other forms of networking. The moving to EC should hence be much easier and faster for simple standardised products and low-investment specificity.

A second view is that of EC as a strategic choice. In this sense, electronic networks can be viewed as a bundle of relationships aimed at reinforcing the strategic position of the firm and, as a consequence, its competitivity in the system.

The third point of view is that of industrial marketing. In this case, attention is focused on the existence or the possible creation of networks between economic actors. As a consequence, the problem is to understand the ability of EC to strengthen relationships and to improve forms of co-ordination along the food chain. Note that, while in the first perspective (transaction costs) EC may be viewed mainly as a force promoting markets instead of structured networks, in the marketing perspective the opposite applies. One of the key actors of the system is, of course, the final consumer. In this sense it is possible to view EC as an instrument to contact the customer and increase his fidelity.

The fourth approach to the problems of EC regards the organisational behaviour. In this sense, the adoption of EC depends on existing relationships among actors, including confidence and reputation. A high level of confidence allows the acceptability of relatively open contracts in which the terms of the exchange are not completely defined. Also, in a system with low levels of information, the bias concerning the use of different technologies may be a major motivation for choosing or rejecting them. One possible conclusion is that the diffusion of EC will push the system towards mixed forms of transaction which are different both from markets and from hierarchies.

Amalgamating the different elements within the approaches illustrated, it is possible to presume that market complexity and asset specificity are the main determinants of the organisation of the system. The organisation and the relationships network between actors determines how entrepreneurs take strategic and proactive decisions, including the adoption of EC.

In this framework consumer attitudes towards EC and Information and Communication Technology (ICT) in general should be also taken into account. Empirical

studies reveal that factors such as that ICT education and the habit of using Internet significantly affect purchase choice, together with product price, transaction security, product characteristics and vendor quality (Liao and Cheung, 2001).

3. Methodology

The methodology adopted is based on an analysis of the 208 web sites and a statistical analysis of their characteristics.

Primary data have been collected through the direct observation of the web sites structure, features, and implementation strategy. The sample selection was carried out using an Internet based directory of web sources in agriculture. The observed features have been codified following a pre-defined set of characteristics and registered into a database form.

Secondary data have been used to complete the dataset with relevant information not available in the web sites such as the number of employees and the annual turnover.

Several classification criteria have been used in order to try to explain different approaches to EC adopted by firms operating at different stages of the food chain sector of activity and having different sizes and orientations.

Descriptive statistics and cross tabulations have been used to analyse the sample data considering general characteristics such as activity specialisation, business orientation, foreign language versions, etc.

An analysis of the functionality of the web sites was carried out by assigning the characteristic to dichotomous variables. These characteristics were grouped under the two following criteria: oriented for the use as promotion tool (focused on communication and advertising), or as a selling tool. For both the promotion and selling criteria, which embody the bulk of the characteristics under investigation, the following two indices were determined:

$$PI_k = \sum_{i=1}^{n} p_{ik} \quad (1)$$

and

$$SI_k = \sum_{j=1}^{m} s_{jk} \quad (2)$$

where:

- PI_k = promotion index for the k company website;
- $p_{ik} = i^{th}$ (0,1) value for each the n promotion characteristics of the k company web site;
- SI_k = selling index for the k company website;
- $s_{jk} = j^{th}$ (0,1) value for each of the m selling characteristics of the k company web site.

These two indices have been used as dependent variables in a two way ANOVA model applied on a subset of the sample, in order to explore differences in agribusiness companies in relation to web site characteristics. The factors used in the model were the firms' turnover and the degree of involvement in the agro-food chain which had respectively two (small-medium firms and large firms) and three (upper, middle and lower stages) levels.

4. Results

4.1. General characteristics of the web sites

The 208 web sites analysed belong to different areas of the agro-food system[2]. These sites are almost all structured in a similar fashion, and their content can be easily summarised as follows: about the company, history and products. Variants regard a direct line with the public, an opportunity to fill in a CV on line, the chance to buy products, FAQ's, quizzes, trivia and food recipes. The sites are aesthetically pleasing, but there is a tendency to swamp

[2] 'Other foods' include processing industries, the bread and cereals industry, canning industries, while 'distribution' includes catering, wholesale and large retail, retailing of organic foods and regional produce etc.

visuals with verbal language, disregarding that people using the Web like fast user-friendly information and do not want to spend time reading (Stecconi, 2000).

The majority of the companies under scrutiny reflect a certain structural complexity: there is a tendency for the company to be responsible for many stages of the agro-food chain. For example, companies involved in the wine or in the meat industry produce, process market and sometimes sell their produce to retailers. This situation is common in Italy for the agro-food system, which is greatly segmented and articulated (Cesaretti et al., 1994). The figures in *table 1*[3] were obtained by crossing the type of activity with the involvement of companies in diverse stages of the agro-food chain.

Table 1: Web sites distribution according to activity and agro-food chain stage.

	Stage of the agro-food chain													
	Suppliers		Services		Agriculture		Processing		Wholesale		Retail		Total	
Activity	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Agritourism	-	-	16	*16.7*	15	*24.6*	6	*4.5*	3	*2*	7	*7.1*	16	*7.7*
Agric. machinery	23	*74.2*	8	*8.3*	2	*3.3*	5	*3.8*	20	*13.2*	17	*17.3*	24	*11.5*
Trading company	3	*9.7*	23	*24*	3	*4.9*	10	*7.6*	19	*12.6*	16	*16.3*	28	*13.5*
Fruit & Vegetables	1	*3.2*	6	*6.3*	4	*6.6*	11	*8.3*	7	*4.6*	1	*1*	15	*7.2*
Nursery plant	-	-	2	*2.1*	1	*1.6*	-	-	2	*1.3*	2	*2*	3	*1.4*
Meat	-	-	2	*2.1*	5	*8.2*	30	*22.7*	31	*20.5*	11	*11.2*	31	*14.9*
Milk & egg	1	*3.2*	5	*5.2*	5	*8.2*	21	*15.9*	21	*13.9*	6	*6.1*	21	*10.1*
Olive oil	-	-	4	*4.2*	1	*1.6*	5	*3.8*	6	*4*	5	*5.1*	6	*2.9*
Other food industry	1	*3.2*	15	*15.6*	-	-	19	*14.4*	23	*15.2*	11	*11.2*	29	*13.9*
Agro-food services	1	*3.2*	8	*8.3*	-	-	-	-	-	-	-	-	8	*3.8*
Wine	1	*3.2*	7	*7.3*	25	*41*	25	*18.9*	19	*12.6*	22	*22.4*	27	*13*
Total *	31	*14.9*	96	*46.2*	61	*29.3*	132	*63.5*	151	*72.6*	98	*47.1*	208	*100*

* Percentage of the total web sites count, many sites are classified into several supply chain stages
Source: Authors' calculation on survey data.

Observing each productive sector altogether, the figures reported in each couple of columns allow us to classify the firms in our sample according to their degree of involvement in the agro-food chain. Thus they can be grouped as follows:

- 32 firms are mainly involved in the upper stage of the agro-food chain (agricultural machinery and services);
- 79 firms are mainly involved the middle stage of the agro-food chain (agri-tourism, fruit and vegetables, dairy produce and wine);
- 97 firms are mainly involved in the lower stage (consumers end) of the agro-food chain (meat, olive oil, other food processing, distribution and nursery plants,).

Furthermore, our investigation clearly shows that different companies' styles of business are evenly spread out: 57 companies are B2B oriented, 82 B2C and 60 are both B2B and B2C oriented[4]. The fact that so many companies are oriented in two directions is probably linked to company size and the sector in which they operate; as most companies are small to medium in size, they need to be both retailer and end-consumer oriented. Unfortunately, not all web sites are actually designed to meet the needs of a "double-face" company.

The use of foreign languages may be an useful indicator for the company's openness to market; 67 companies, most of them involved in foreign commerce, use Italian only, thus neglecting the importance of languages as a commercial strategy to promote their image and

[3] The first column of the contingency table, obtained from a multiple dichotomy response analysis, illustrates the involvement of firms belonging to a particular sector in more (or in some cases all) stages of the agro-food chain. The relative weighting of the sector on the chain stage is reported in the second column.

[4] For 9 firms it was not possible to classify their typology of business.

their products to consumers who live in other cultural contexts[5]. The remaining 141 web sites tend to use English exclusively (*table 2*), strengthening the view of English as a standard communication tool. The use of other languages (i.e. French and German) occurs to privilege special trade partnerships.

Table 2: Foreign languages used in web sites

	Count		Responses in %*	% of cases **	% of web sites ***
no foreign language	67				32.2
at least one foreign lang.	141				
- English		139	58.4	98.6	66.8
- German		51	21.4	36.2	24.5
- French		40	16.8	28.4	19.2
- Other foreign languages		8	3.4	5.7	3.8
Total	208	238	100.0	100.0	100.0

* Percentage on total count of 238 for. lang.; ** Percentage on 141 cases; *** Percentage on 208 web sites
Source: Authors' calculation on survey data.

Roughly 90% of the analysed web sites are easy to surf even though over 2/3 were lacking in interactive features. All the sites were easily located with search engines, 90% were located in a dedicated gateway and less than 20% in an e-mall.

4.2. Functionality of the web sites

The presence of several web pages in almost all the sites examined indicates an awareness of the importance of communication and times when companies entered cyberspace with a single web page seem now over. All sites include the presence of company profiles and descriptions of what is being marketed.

However, we may note that many sites have entered the Internet with little sense of reality. In fact, 54.9% do not provide information regarding how to reach the company's location, and a mere 7.8% give information on opening times, while it is quite likely that people may surf such web pages precisely in order to obtain this type of information.

The main characteristics describing the web sites' capacity to function as promotional instruments for the firm is summarised in *table 3*. Despite the fact that all the companies present at least one of the characteristics chosen to explore the sites' marketing potential, regrettably they appear to be incomplete in terms of marketing instruments. The presence of a catalogue of products, pictures of goods and services, information about production process and photographs of the company are quite common features.

On the other hand, what emerges is a lack of attention paid to interaction with visitors to the site, a shortage of detailed information regarding goods and services, and the absence information on quality issues emerges. Clients have very little opportunity to provide feedback to the company regarding its goods and services, few sites implement mailing lists, or elicit opinions regarding the site and hardly any sites exploit the possibility of communication in real time. More sites perhaps should feature forms which gather information on goods and services, although some do mention a privacy clause and allow the client to register.

[5] For a detailed discussion on the issues of language management and communication of firms involved in foreign trade relationships see Chiaro and Nocella (2001).

Table 3: Features related to web sites' capacity to function as a promotion tool.

	Responses		Cases
	No.	in %*	in %**
Presence of on-line catalogue or data-base	179	14.5	86.1
Products description	165	13.3	79.3
Information on production process	115	9.3	55.3
Photos of firms which contribute to goods and/or service	105	8.5	50.5
Form to request information about products and services	92	7.4	44.2
Marketing of traditional/local products according to EU regulations	86	7	41.3
Privacy statement	83	6.7	39.9
Registration procedure for visitors	74	6	35.6
Complete information on source of raw materials	62	5	29.8
Information on outlets and retailers	61	4.9	29.3
Names and e-mails of staff members in different sectors	56	4.5	26.9
Presence of Quality Management System certification	48	3.9	23.1
Accuracy of description of goods and services	37	3	17.8
Opportunity to express opinion on goods and services	31	2.5	14.9
Mailing list	21	1.7	10.1
Request for opinion on site's aesthetic	19	1.5	9.1
Opportunity for real time communication	2	0.2	1.0
Total	1236	100	

*Percentage on total count; ** Percentage on 206 cases
Source: Authors' calculations on survey data.

Possibly, interactive features are lacking because of the absence of qualified staff able to set up such services. This would require additional financial investments which may well be risky for small to medium sized companies. Finally, it is worth noting that most companies give little or no information regarding important elements such as the origin of raw materials, retail outlets or even the names of staff members. It would appear that most companies still do not see cyberspace as the right place to exchange certain types of information, or that such subjects should remain reserved.

With regard to using the site as a selling instrument, exactly half the sample presented none of the features under consideration, while two of these features (the opportunity to pay into by banker's order or direct debit and the use of pre-paid smart cards) were not used by any companies. The characteristics presented in *table 4* give a rough idea of how the surfer can interact with the virtual salesperson. It is interesting to see that while information regarding modality of buying goods, postage charges and times of delivery were included in over than 50% of the remaining companies, very few cater for payment on line. The most common system of payment is by credit card, followed by bankers order and cash on delivery. Promotions and/or offers are infrequent. All this demonstrates that e-commerce in substitution of traditional commerce is still undergoing teething problems in the agribusiness sector. It would appear that virtual traders do not take into account that clients are very real and that they require payment facilities and services.

Table 4: Features related to web sites' capacity to function as a selling tool

	Responses		Cases
	No.	in %*	in %**
Prices of goods and services included	70	9.4	67.3
Opportunity to buy on-line	63	8.5	60.6
Localisation of goods via search engine	62	8.3	59.6
Information on payment systems	57	7.7	54.8
Opportunity of diverse forms of payment	57	7.7	54.8
Description of legal conditions of sale	51	6.9	49.0
Information regarding delivery of goods	50	6.7	48.1
Payment on-line	45	6.1	43.3
Refund possibilities	45	6.1	43.3
Payment buy credit card	42	5.7	40.4
Information on times of delivery	42	5.7	40.4
Information on safety of credit card payment	39	5.2	37.5
Payment in advance by bankers' order	36	4.8	34.6
Promotions and special offers	27	3.6	26.0
Payment on delivery	22	3.0	21.2
Information on order fulfilment state	10	1.3	9.6
Payment by cash on delivery	9	1.2	8.7
Payment by postal order	6	0.8	5.8
Payment by cheque	5	0.7	4.8
Payment by letter of credit	5	0.7	4.8
Total	743	100.0	714.4

Source: Authors' calculations on survey data.

4.3. Differences in agribusiness firms according to web site characteristics

The independent variables included in the ANOVA model are the stage of the agro-food chain (see paragraph 4.1) and the annual turnover. The latter data were collected from the gateway of the Italian chamber of trade and since they were available for only 114 companies[6] the ANOVA was conducted only on this subset of the sample. According to their turnover, the agribusiness firms were classified as a small/medium firms where annual sales were less or equal to 10 million EUR (62.3%) and as large firms elsewhere (37.7%). Before presenting the ANOVA results the two indices will be explored using descriptive statistics.

The descriptive statistics regarding PI and SI display a clear difference in their mean values which are respectively 10.05 and 2.47 thus highlighting that firms tend to discard virtual trade (*Fig. 1*). Moreover, from the plot of 95% confidence interval for these means and considering that the SI could have totaled a maximum of twenty (the number of characteristics investigated) we can infer that the population of agribusiness firms considered tends not to regard web sites in terms of selling resources but rather as promotion tools.

[6] Data were gathered from the following url: http://www.camcom.it

	PI	SI
N° of cases	114	114
Mean	10.05	2.47
Min	2	0
Max	17	15
Dev. St.	3.49	4.58

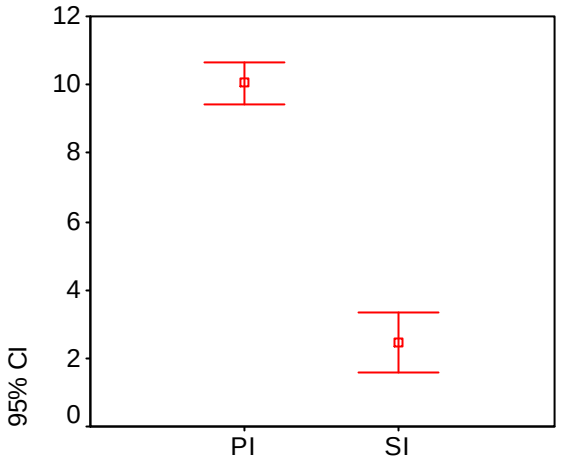

Fig. 1: Descriptive statistics of promotion and selling indices and relative plot of 95% confidence interval (CI) for their means.

The comparison of the means of the PI in relation to firms' turnover and level of involvement in the agro-food chain (*Fig. 2*) indicates that large firms are inclined to be more concerned with marketing than small firms. Furthermore, it would appear that the use of a web site as a promotion tool is more common in companies located at the consumer end of the agro-food chain.

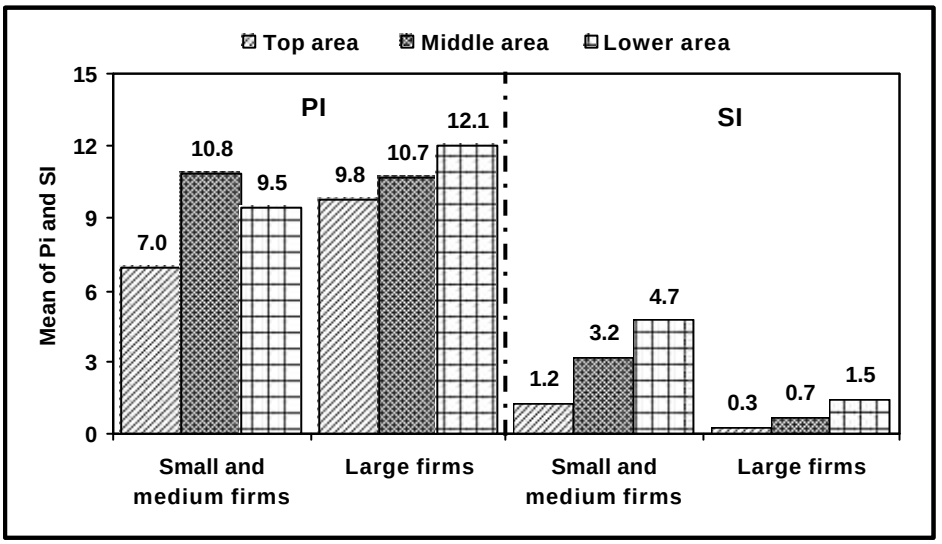

Fig. 2: Comparison of the means of the promotion index and of the selling index in relation to firms' annual turnover and level of involvement in the agro-food chain.

The comparison of the PI and SI in relation to firms' turnover and level of involvement in the agro-food chain is also significant, as here too, the Web is chiefly used by companies situated in the lower area. Surprisingly, in this case, small and medium sized firms are those most involved in virtual trade.

The two-way ANOVA table for testing the hypothesis of the population's values for average PI and SI (*table 5*) shows that for both indices there are no interaction effects. In fact, the observed significance levels for the no-interaction hypothesis are 0.1007 for the promotion indices and 0.6940 for the selling indices. Thus the absence of interaction seems to indicate that it is reasonable to believe that differences in average indices between small-

medium firms and large firms are the same over and above their degree of involvement in the agro-food chain.

Table 5: Two-way ANOVA table for PI and SI.

Dependent Variable: PI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	271.08 [a]	5	54.22	5.30	0.0002
Intercept	7347.34	1	7347.34	718.37	0.0000
Firm's annual turnover (FT)	55.25	1	55.25	5.40	0.0220
Involvement in Agro-food chain (IAFC)	64.37	2	32.18	3.15	0.0470
FT*IAFC	47.98	2	23.99	2.35	0.1007
Error	1104.61	108	10.23		
Total	12896.00	114			
Corrected Total	1375.68	113			

a R Squared = .197 (Adjusted R Squared = .160)

Dependent Variable: SI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	292.36 [b]	5	58.47	3.04	0.0131
Intercept	272.79	1	272.79	14.20	0.0003
Firm's annual turnover (FT)	93.69	1	93.69	4.88	0.0293
Involvement in Agro-food chain (IAFC)	67.41	2	33.71	1.76	0.1778
FT*IAFC	14.08	2	7.04	0.37	0.6940
Error	2074.06	108	19.20		
Total	3064.00	114			
Corrected Total	2366.42	113			

b R Squared = .124 (Adjusted R Squared = .083)
Source: Authors' calculations on survey data.

Furthermore, there is a main effect in the firms' turnover factor for both the promotion indices ($F_{.05}(1, 108) = 5.40$; $p < 0.03$) and for the selling indices ($F_{.05}(1, 108) = 4.88$; $p < 0.03$) and also a main effect in the degree of involvement factor for the promotion indices ($F_{.05}(2, 108)=3.15$; $p<0.05$). As a result, we reject the null hypothesis that the population's means for these groups are the same. So, most probably the large firms and those involved in the low area of the agro-food chain are using their web site more as a promotion tool, while, even if no firms are exploiting the potentiality of their web site as a selling instrument, it is the small and medium firms which are venturing out and taking a technological leap forward.

5. Discussion

The results show a low level of use of Internet and a limited variety of adoption strategies. The positive expectations regarding the use of EC seems to have disappeared, and have been substituted by a more realistic and sometimes pessimistic approach.

Producers of goods for which EC has comparative advantages are now developing professional sites, while others, that in the past developed web sites on a do-it-yourself basis, are now stopping their activity. In any case, agriculture and agribusiness firms actually make little investment in EC and seem to actually assign small value to it in terms of opportunity cost and strategic position. At the same time, where such innovation is used, a conservative approach was mainly adopted, adding it to existing organisational structures as a faster way of doing old things, rather than a revolutionary approach, that would have required a new organisational strategy for the firm (Canavari et al., 2001).

Altogether, while the Internet and EC can be perceived as a powerful way of communication and information, the direct sell of products is still confined to market niches. The illusion that the age of Internet would reverse the disadvantages of small firms presently appears unrealistic, even if signs of a certain interest by small/medium companies in the lower stage of the agro-food chain may still be caught.

To conclude, in agribusiness the exploration of the new channel represented by EC is still underway and proceeds slowly. Yet, the technological delay offers development prospects in the agro-food sector, where operators may learn from the mistakes of those already working (and losing money) with EC in other business areas, considering that every stage of on line shopping should still be improved, from the website design to delivery. So, shortcomings faced by big companies (Marks & Spencer, Toys' R, Argos, Blackwell and so on, as reported in Sunday Times, 2003), such as insisting on frustrating procedure registration before buying, waiting too long for a refund and getting stuck on a overloaded website should be avoided. Investments must be made in view of satisfying the expectations and the needs of costumers, regardless to the business model adopted.

However, interesting opportunities for further development in the agro-food sector are still to be explored, i.e. on the pathway of strengthening the connections throughout the supply chain. Further technical advance, as well as the reduction of Internet divide among consumers may act as relevant factors for future developments.

This research also calls for a more pragmatic policy in the field of EC and computer tools in the agro-food sector. Providing funding may be important in order to start new businesses, but they need to be cautiously evaluated in order to guarantee their success and to avoid to create further illusions in this field. Also, effective networking services and coordination activities can be more important than traditional firm-based subsidies.

REFERENCES

Canavari M., Rivaroli S., Spadoni R. (2001). Penetration of e-commerce tools in the organic food industry: analysis of its impact on the organic noodle and bakery product sector. In: *E-Commerce and Electronic Markets in Agribusiness and Supply Chains*, Schiefer G., Helbig R., Rickert U. (eds.), Bonn: Universität Bonn-ILB, pp. 249-258.

Cesaretti G. P., Mariani A.C., Sodano V. (1994). Sistema Agroalimentare e mercati agricoli, Bologna: Il Mulino.

Chiaro D., Nocella G. (1999). Language Management in Italy: A survey of the Translation Market in Emilia Romagna, in: *Textus*, Basnett S., Bosinelli R. M., and Ullrych M. (eds.), Vol. XII, 2:351-368.

Holland C.P., Lockett A.G. (1997). Mixed mode operation of electronic markets and electronic hierarchies. In: *The formation of inter-organizational networks*; Ebers M. (ed.); Oxford University Press: Oxford. pp. 238-261.

ISTAT (2000). 5° Censimento generale dell'agricoltura. Roma

Kuhlmann F., Brodersen C. (2001). Information technology and farm management: developments and perspectives, *Computers and electronics in agriculture*, 30:71-83.

Liao Z., Cheung M.T. (2001). Internet based e-shopping and consumer attitudes: an empirical study, *Information & Management*, 38:299-306.

Prati C. (2002). Agricoltura e computer, rapporto che progredisce, *Agricoltura*, november: 18-19.

Sarracco A. (2002). Coltivare un sito web? Scelta promettente, ma…, *Agricoltura*, november: 20-21.

Stecconi U. (2000), Translating like a Spider: an empirical study of translated websites (paper presented at international conference on translation studies at UMIST, April 2000).