

9. IT-Driven Modernisation in Agriculture: New theories for a new phenomenon¹

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Abstract

The information systems (IS) literature has largely neglected the study of implementations of large-scale strategic initiatives to modernise the agricultural business. This chapter reports an ongoing empirical study of the efforts of a multibillion-dollar organisation to modernise the operations of its supplier base. Modernisation, as an external force affecting organisations, is a new and different phenomenon with respect to organisational change that is normally considered as resulting from internal effort. Modernisation is an ongoing, evolving process performed by organisations in order to survive and prosper. Yet the decision to modernise is likely to face the forces of entrenched traditions and practices: the feelings and social significance of established ways of those with the power to derail the modernisation project. Using institutional theory as the theoretical lens through which to study the role of information and communication technologies (ICT) in modernisation strategy, this chapter argues that managers should take care to go beyond the reasons for change, considering as well the physical, social and cultural needs of the stakeholders involved. Our study extends the literature on agribusiness management by highlighting the tensions between the initiator of a modernisation effort and the suppliers who will need to adapt and respond to it.

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Current Issues and Trends in IS and Agribusiness

The impact of technology on an organisation is a classic topic in information systems (IS) research. Typically, however, the level of analysis is the organisation itself, or teams or individual people within it. The tendency is to move to 'lower' levels of analysis with ever finer research instruments. Consequently, IS theories often fail us when we want to theorise, not about an organisation wanting to implement a particular new internal system, but rather about an organisation that wants to change an entire sector or industry. This problem is not uncommon, with examples ranging from a government that wants to change the way its employees work (Senyucel, 2008) or that might want to implement the same information technology (IT) system in all of its municipalities (Kaylor et al., 2001), to a supermarket chain wanting all of its suppliers to use the same supply chain system (Stalk et al., 1992) and a manufacturer demanding that all of its suppliers pass through the same Internet portal (Klein and Krcmar, 2006). The challenges of these cases are different because the 'victims' of the implementation initiative are not under the direct control of the initiative taker, and because they have their own specific way of working, and might even have specific cultures or traditions that might align against the initiative. This process is, thus, not that of classic organisational change but instead what sociologists call *modernisation*.

In the past this problem was dealt with mainly as a strategic problem related to the bargaining power of buyers and suppliers. When electronic data interchange (EDI) was the leading technology in supply chain modernisation, a classic warning was issued: 'EDI your suppliers before your client EDIs you.' Modernisation through technology was a strategic matter. Despite the fact that this still holds true, it is only one side of the coin. Information technology-driven modernisation processes have for the most part failed (Klein and Krcmar, 2006; Rossignoli et al. 2009), mostly because, behind the bargaining power, their transformative implications were not well understood. Our interest lies in taking seriously these large-scale transformative processes to try to understand their adoption and diffusion dynamics. Of particular concern to us is the continuous process of adaptation in which the modernising organisation uses ICT as a significant and transformative tool to modernise a sector or industry populated by organisations that will be on the receiving end: the 'modernisees'. Rather than taking a functionalist focus, we are interested in how the stakeholders interact during a modernisation process and how the result of this interaction leads to a new state desired by the moderniser, or derails the modernisation attempt. Our guiding research questions are:

- How do people in the modernising organisation enact modernisation strategies?
- How do people in the modernisee organisations react to modernisation strategies?
- How do stakeholders' actions contribute to (or detract from) the modernisation initiative?

To start the process of finding answers to these questions, we adopt an interpretative epistemology using mainly qualitative data from case studies (Walsham, 1995). Adopting a particular research paradigm also implies the adoption of a system of beliefs about the ontological, epistemological and methodological nature of the world and how to investigate it (Guba and Lincoln, 1994). We use institutional theory (Scott, 2008) as a theoretical lens through which to make sense of our findings since our data analysis showed that modernisation replicates many of the traits of institutional change.

Our chapter aims to contribute to academic and practical knowledge of modernisation processes in agribusiness, which is an industry that is critical to an ever-growing population with an increasing demand for food both in terms of quality and quantity. It is puzzling to us that, while we depend on the success of agribusiness to cover the most basic of our human needs, the agribusiness sector has largely failed to attract the attention of information systems and management researchers. The lack of academic interest seems particularly prevalent in developed economies where only a handful of papers report on modernisation of business practices in agribusiness (for example, Gregor and Jones, 1999; Lindsey et al., 1990). Further, studies involving innovation are often conducted from a perspective of technical rationality that is not always appropriate to non-technical processes in which problems and solutions are unclear, confusing and conflicting (Schön, 1983). In our particular case, the modernisation process offers many uncertainties and the role of ICT is ill defined. Thus, we aim to engage in a discourse that considers the existence of conflicts between ends and means. We agree with Schön (1983, p. 127) that '[i]t is rather through the non-technical process of framing the problematic situation that we may organise and clarify both [the] ends to be achieved and the possible means of achieving them'.

The rest of the chapter is organised as follows. We first present a brief discussion of the literature dealing with modernisation practices and the role of ICT in those practices, including the modernising of traditional industries such as agribusiness. Then, we present institutional theory as a lens through which to make sense of modernisation and, before presenting in detail the case under study, discuss the nature of the research project, its delimitation and the methodological approach followed. The discussion focuses on the tension

between conflicting demands and the rationale for a favourable outcome. We conclude by arguing for the importance of this type of study, note its limitations and describe the nature of the next phase of research.

Modernisation Practices

While modernisation has largely escaped the attention of IS researchers (perhaps because of the organisation or user focus of IS research), its meaning of 'being modern' is fertile ground for the work of sociologists and philosophers. In sociology, modernisation is conceived as a process of social evolution that brings societies inexorably from simple coordination and control, production and distribution structures to ever-greater levels of development and civilisation, usually characterised by increasing complexity. This evolution has been perceived as a Darwinian process of survival of the fittest (Spencer and Carneiro, 1974; Turner, 2000), where modernisation implies a change from a present state to a future state, possibly *progress* towards a better state according to some measure. In societal terms, modernisation aimed at achieving a 'better' state is culturally defined, and not typically universally accepted. Acceptance of the 'better' state depends on the observer: the moderniser or the modernisee. Its nature might be viewed from a functional perspective that is related to the achievement of a more productive state (Spencer and Carneiro, 1974) or it might be social, focusing on more emancipation or more equal opportunities and where modernisation is 'a progressive force promising to liberate humankind from ignorance and irrationality' (Rosenau, 1992, p. 5).

The terms *modernity* and *modernisation* are of course tightly connected; modernity defines the state and modernisation the process to reach that state. Connected as they are, these terms are still intensely debated by sociologists. But while the ontological debate about the meaning, nature and purpose of both modernity and modernisation is outside the scope and focus of this chapter, we nevertheless need to define our views. By modernising, we imply a departure from past practices, not just a change. We also accept that modernisation is 'a state of consciousness which defines the present in its relation to the past' (Delanty, 2006, p. 82).

While the sociological debate focuses on mega-trends and speaks of unavoidable consequences and unstoppable floods, management theories are focused on control and performance, so, not surprisingly, discussions about modernity are largely absent from IS research. Nonetheless, the connection between technology and 'the way things get done' has been discussed both by academics (Malone and Laubacher, 1998; Scott Morton, 1971) and by lay observers (Friedman, 2006).

The connection between ICT and modernity should not be surprising. Over time, we have grown accustomed to the belief that ICT plays a central role in modernising organisations and societies alike. Yet Misa (2004) points out that, albeit with a few exceptions, this belief is not supported by sufficient theoretical work, and only lately have researchers begun to theorise about the entanglement between the concepts of ICT and modernisation.

ICT and Modernisation

The implementation of ICT in organisations might be explained from two alternative perspectives: the functionalist and the subjective (Markus and Robey, 1988). The functionalist perspective sees the process of modernisation as an inevitable process of adaptation to technological, societal and structural changes, where the dominating decision factor is the achievement of improvement in performance—of some form or other. Modernisation is therefore seen as a rational process of pursuing ever-increasing levels of performance. In the functionalist view, performance and its increments can be measured and therefore progress is inevitable and non-compliance is seen as resistance or sabotage and it is therefore sanctionable (Bain and Taylor, 2000; Foucault, 1977; Sewell, 1998). As societies evolve, they experience more and more problems of coordination, production of goods, services and knowledge, and finally in finding ways of distributing these resources. Latour (1993) defines the modernisation process as one of purification and translation. As complexity in society increases, the need to divide elements emerges—humans from non-humans—and to interconnect them again. In functionalist terms, the effort is therefore one of optimisation of subsystems and the coordination among them.

The subjectivist view sees the modernisation process as a less predictable path led by the multiple interpretations of reality that individuals develop. Modernisation is not seen as unidirectional increments, but change is instead seen as an organic process where individuals continuously adapt to emerging interpretations of their world across multiple dimensions (Cecez-Kecmanovic et al., 1999; Zuboff, 1988). Taking a subjectivist perspective, the results of introducing technology into organisations depend more on the interpretation of the technology by the actors involved than on the intrinsic characteristics of the technology itself (Orlikowski, 1993). In this view, whether *progress* is reliant on technological innovation depends on the observer and is open for debate.

Despite criticisms and different perspectives, technology and its development have traditionally been linked to the process of modernisation. Not surprisingly, it has been argued that the eras of human modernity have coincided with new discoveries that have radically changed the structure of society (Misa, 2004). For example, the Industrial Revolution had at its core technological innovations such

as the steam engine, textile machinery and production techniques, and also the use and sharing of technological knowledge (Senyucel, 2008). The combination of these elements provided the seeds of the contemporary interpretation of modernity, including the hierarchical structuring of organisations and the division of labour.

While the early periods of IS research had an overly functionalist view of the role of IT in organisations, the later period, which arguably started with Markus (1983) dealing with power and politics in Management Information System (MIS) implementations, is marked by a more balanced view. Today we observe that IS research on the role of IT in modernisation is divided into three groups: those who propose that technological evolution will lead organisations through certain modernisation paths (Gibson and Nolan, 1974; Scott Morton, 1971); those who propose that individual agents will shape the technology to their own will (Cecez-Kecmanovic et al., 1999; Zuboff, 1988); and those who posit that individuals will use technology among many other tools in their practices, and ultimately practices will shape structures or be shaped by them (Barley, 1986; DeSanctis and Poole, 1994; Orlikowski, 2000).

At present, there is no theory of modernity that embraces these three views, especially when the locus of interest is not just the organisation but also an entire industry. Furthermore, while we know that dedicated modernisation efforts can influence the way people work, there is still a need for theorising on the connections between ICT and efforts to change deeply entire industries that have so far managed to remain impervious to the otherwise pervasive flood of information and communication technologies.

ICT and the Modernisation of Agribusiness

If studies of ICT as a tool of modernisation are scarce, those looking at ICT as a tool for modernisation in agribusiness industries are even more so. Among the very few we were able to find, and perhaps the closest to our field of interest, is an action research study conducted by Gregor and Jones (1999) that reports on the successful development and adoption of electronic commerce in the Australian beef industry. They use the theory of diffusion of innovations (Rogers, 1995) as their theoretical lens and contribute to our understanding of communication and communication channels in terms of adoption.

A contrasting case, also in the Australian beef industry, is offered by a study of Business to Business (B2B) marketplaces that reports a low rate of adoption. Factors contributing to the poor adoption rate included the difference of perceived advantages at group and at individual levels, the users' reluctance to change traditional ways of trading, the power of the users to opt (or not) for the new system and, finally, the slow pace of adoption creating a situation in which

a critical mass of users was not achieved in a timely manner (Driedonks et al., 2003). Rogers' theory of the diffusion of innovations was again used, although this time in conjunction with Kambil and van Heck's (1998) model of exchange processes. The study found that Kambil and van Heck's model does not suit 'situations in which the adoption decision is optional' (Driedonks et al., 2003, p. 37) and this finding is relevant to our study because we are also dealing with powerful (or at least not powerless) potential adopters, as the description of our study and foundation case will explain.

Institutional Pressures and Modernisation

While Gregor and Jones (1999) used diffusion theory, they were not exactly focusing on modernisation processes but rather on the diffusion of e-commerce in the beef industry. Modernisation has a diffusion component but, as explained above, it is a very multifaceted phenomenon. It is characterised by a central organisation wanting to change, with technology, the behaviour of many supplier organisations that are typically very entrenched in their practices and very conservative users of ICT as a management tool. This is a story of traditions spanning organisational boundaries, similar behaviours influenced by laws, norms and networks, and a seemingly unjustified resistance to technology. Institutional theory provides us with the instruments to make sense of these instances and to understand technology-driven change (Barley, 1986). Multilevel analysis (Scott, 2008) can help us understand the influence of society and the network on the individual firm, isomorphic forces can help to understand horizontal changes (Di Maggio and Powell, 1983) and rationalised myths can help to understand institutionally driven interpretations.

The main aspect that characterises agribusiness is the cohesiveness among members and the need for coordination to move perishable products quickly and in a controlled way through the supply chain. These stringent needs—like the necessity to continuously control the cold chain for some products—require not only coordination but also trust along the supply chain. This trust is often enacted through professional networks or, as in our case, in very large cooperative agreements regulated by contracts and rules.

A way to regard this industry is to consider its institutional elements. Trust, in particular, can be explained according to the culture and traditions of the organisations involved. By investigating this issue through an institutional theory lens, we might better understand the persistent influences on how institutions emerge, survive, change and dissolve. This approach also notes the

pervasive influence of institutions on human behaviour, including processes by which rules, routines, norms and belief systems guide social behaviour (Scott, 2008; Svejvig and Carugati, 2010).

Social actions exist in accordance with or in reaction to complex, durable, resilient social structures (Currie, 2009), governed by organised, established procedures and rules that constitute the essence of institutions. In modernisation attempts, we can therefore expect that institutions and the rules of the game will affect what the modernisees will and can do. Institutional rules can guide actions in certain directions independently of or in complete contrast with the modernisation effort (Vitharana and Dharwadkar, 2007).

Institutional theory highlights the mechanism of isomorphism—‘a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions’ (Di Maggio and Powell, 1983, p. 72). Therefore, similar organisations in the same environment tend to pursue similar courses of action. Isomorphism derives from three underlying pressures in the institutional environment: mimetic, normative and coercive.

Mimetic pressure arises from similar interpretations of the organisational field, such that organisations mimic other successful organisations they consider similar to them (Di Maggio and Powell, 1983). The assumption is that what has worked in the past for one organisation will continue to work for other organisations. The decision to implement a specific information system or a specific business process often depends more on the environment—that is, on what other similar organisations are doing—than on any objective needs that are parts of the modernisation processes.

Normative pressures induce isomorphism through the shared respect for unwritten codes of conduct or traditions. Professions and industries absorb such traditions, often by hiring people from similar educational backgrounds. Over time, normative pressures permeate the business and dictate what should be done and how to approach problems. For example, when a firm realises that most of its competitors are adopting a specific protocol and procedure, it will tend to adopt similar protocols and procedures to achieve legitimacy among its customers and business partners (Vitharana and Dharwadkar, 2007).

Coercive pressures instead emerge from legislation and technological changes that compel the organisation to adapt (Tushman and Anderson, 1986). For instance, the European Union introduced the requirement for milk traceability and other norms that force all the actors operating in the milk supply chain to declare all information regarding their procedures. A collective respect for these norms will therefore create equal behaviour or, in other words, isomorphism.

Isomorphism is not, however, either force or resistance. Rather, the isomorphic pressures can act both as a brake and as an accelerator of change, depending on

the particular situation that a market is in and the momentum that a particular initiative is having. In our case, we note that all three pressures can be present and jointly affect the modernisation practices.

Furthermore, isomorphic pressures act at multiple levels. Scott (2008) identifies four levels of mutual influence: society, organisational field (defined as 'organisations that, in the aggregate, constitute a recognised area of institutional life' (Di Maggio and Powell, 1983, p. 1983)), organisation and individual actor. Currie (2009) encourages IS researchers to conduct multilevel analyses to enrich understanding. Organisational fields can develop professional codes of conduct, perhaps regardless of legislation, though Scott (2008) finds reciprocal interactions across levels such that the societal level connects to the individual level through the organisational field level, and vice versa. Through institutional change and the diffusion of practices, top-down processes allow higher-level structures to shape the structure and action of lower levels—something that would be desirable in modernisation processes but that can also work in the opposite direction and thwart the initiative.

Institutional theory, with its ability to highlight both change and resistance and top-down and bottom-up influences, is therefore a powerful tool for understanding the complex modernisation phenomenon.

Research Methodology for the Empirical Study

In this chapter we report the first phase (or foundation case) of a long-term, theory-making, exploratory research project. It focuses on an important agribusiness organisation that is undertaking a process of modernisation of their (arguably) conservative practices. Given the ultimate goal of theory development, we needed to adopt a methodological approach that allows for the rigorous treatment of data and for the evolution and integration of knowledge. This section briefly describes our methodological approach and the limits for the study.

Given the potential scope of the research project, it was necessary to define from the outset the limits of the study (Creswell, 1994). Accordingly, our study focuses on cases where top management decides to modernise their operations by implementing new technologies to ensure the continuing prosperity and survival of their organisation. We further limited our study to situations in which the people required to adopt new technologies and practices are: a) relatively free to adopt or to reject the new technology, and b) experience a certain cultural attachment to their *old ways* of operating. In this sense, we are seeking technologies that, while rationally necessary for the organisation to adopt, have the potential to be socially or culturally disruptive to the end

users. That is, we focus on cases in which the new technology replaces an entrenched tradition, or way of doing business, among the actors. The final delimitation of the study relates to the nature of the national economies in which the organisations reside. While it is common for research on modernity to be concerned with developing countries, we wanted to observe modernisation practices in developed nations. Thus, suitable organisations for this study must be located in countries that are among the top 30 economies in terms of gross domestic product (GDP), as defined by either the International Monetary Fund (IMF) or the World Bank (WB).

To start the study, we required a suitable research site in which to conduct an exploration that would allow us to find guiding themes and relevant concepts critical to further explorations, using more relevant and sharper questions (Eisenhardt, 1989). In other words, we adopted a theoretical sampling strategy based on relevance and emergence (Glaser, 1978) rather than the random sampling strategy suitable for other approaches. The unit of analysis for our study is the modernisation attempt as a whole and this implies that we also need to analyse the technological and contextual components and actors involved in the case. We thus need both rich empirical data and access to multiple stakeholders—two critical elements for theoretical triangulation and conceptual development.

Given the importance of context to our study, we also needed to find specific cases of modernisation from which we could derive knowledge through the rigorous interpretation of actions, accounts and patterns found in the data. To achieve this we adopted an interpretative case study approach (Walsham, 1995), collecting and analysing data following the principles of classic grounded theory methodology (Glaser, 1978, 1998; Glaser and Strauss, 1967).

The approach we adopted has been described as an effective and appropriate way of researching emerging phenomena in their own organisational and human context (Orlikowski, 1993; Van de Ven and Poole, 1989). Furthermore, this approach allows us to explore the substantive area of study in order to produce grounded explanations of the phenomena under observation (as suggested by Eisenhardt, 1989; Orlikowski, 1993) that is informed but not hijacked by the extant literature and institutional theory.

The founding element for our research is a longitudinal case study that takes place in a large cooperative organisation in the economically important Italian dairy sector. From this case we have collected rich data via interviews, web site analysis, on-site observations and documents such as web site logs and electronic web services (for example, descriptions of processes and practices, news and newsletters). The next section presents our foundation case.

Case Description: Quattro and 4HQ

The foundation case follows a modernisation initiative called Quattro (a pseudonym) implemented by an association of cooperatives in the agricultural industry operating in Italy, the seventh country in the world in terms of (GDP), according to lists produced in 2008 by both the IMF and the World Bank. Quattro is a business organisation owned by four agricultural cooperatives (each owning a 25 per cent share) and has at its core the development, implementation and management of an information system we call 4HQ, where HQ stands for 'high quality'.

We selected this case based on the characteristics of the organisation with regard to the need for modernisation, the complexity of the business, the coexistence of multiple views on modernisation and the use of ICT as an enabler of modernisation. We have been able to obtain rich data and access to documents and key people in the organisation (CEO, general managers, directors, CIO and farmers).

To explain the Quattro case, the following subsections: 1) describe the organisational characteristics and its historical background, and 2) explain the driver for modernisation and the modernisation project.

The Social Enterprise of Cooperatives

According to the *Macquarie Dictionary*, a cooperative society is a 'business undertaking owned and controlled by its members, and formed to provide them with work or with goods at advantageous prices (a consumers' cooperative is owned by its clients, a producers' cooperative is owned by the workers)'. The concept of cooperatives developed in the nineteenth century. It was connected to the socialist movement and opposition to the system of manufacturing that resulted from the Industrial Revolution. The principal characteristics of a cooperative are that the participants are moved by egalitarianism and solidarity motives more than by the need to achieve personal success (Thompson, 1824). As a social structure, a cooperative can be seen as a clan, a group that shares values and beliefs, thus allowing minimisation of goal incongruence and toleration of high levels of ambiguity in performance evaluation (Ouchi, 1980).

Nowadays, cooperatives are social enterprises that take different forms and sizes and enact different systems of control and ownership (Ridley-Duff, 2009). Furthermore, cooperatives can be an important economic contributor. In Italy, cooperatives generate between 5 per cent (source Legacoop) and 8 per cent (source UNCI) of national GDP and involve about one million people across the country, touching the lives of practically every Italian. The Italian cooperatives

involved in our study (the Coops) are formed and owned by more than 2000 farmers (dairy producers) and have a combined annual turnover of more than €1 billion (see Table 9.1).

Table 9.1 Participating Cooperatives' Membership Size and Annual Turnover

Cooperatives	No. of members	Turnover (€ million)	Turnover (€ million) per member—avg.
Coop 1	231	120	0.52
Coop 2	180	40	0.22
Coop 3	1600	990	0.62
Coop 4	250	18	0.07
Total	2261	1168	0.56

Members (farmers) contribute to the enterprise by contributing work or capital to the cooperative. In compensation, they receive shares and dividends from the cooperative as well as being able to access its services and resources. These farmers have two main ways of influencing decisions via the exercise of voting rights. First, they elect the members of the board of directors, who must be members of the cooperative, and the CEO (also a member) in charge of managing the cooperative. Second, acting as shareholders, farmers are able to vote during annual general meetings. It should, however, be noted that each member has the right to only a single vote, regardless of the share equity they have in the cooperative (this is part of the egalitarian doctrine of cooperatives).

The Business Environment: Market and regulatory pressures

The processing, manufacturing and distribution of dairy products across Italy and the world form the core business of the Coops. The business association of the Coops in the Quattro venture was part of a strategy to modernise their operations in response to external pressures from the European Union and from major corporate customers.

Following a new regulation introduced by the European Community (Regulation EC No. 178/2002 atr.3), which established strict rules regarding the traceability of agricultural products, the Coops felt that the food industry was under pressure to: 1) respond to consumer demands for products of high quality and reliability; 2) provide greater transparency in order to increase consumer confidence in the Italian agricultural system; and 3) introduce strict protocols and controls in the industry.

The Coops also needed to increase the efficiency of their supply chain in response to demands from corporate customers known as *Grande Distribuzione*

Organizzata (*GDO*) or 'large distribution business'. The *GDO* customers are the most important distribution chains for food products (among other products) and include large distribution businesses such as COOP Italia, Esselunga, Supermercati PAM, Conad and SIGMA. Examples of *GDOs* outside Italy include Carrefour and Auchan in France, Tesco and Marks and Spenser in the United Kingdom and Wal-Mart in the United States. Given their significant bargaining power, the *GDO* customers are often able to define the terms and conditions of transactions and they require a highly efficient supply chain.

Paving the Way: Intentions and outcomes

To address the pressures, the Coops decided to join forces in order to implement an information system that would allow a more effective integration of different actors along the supply chain. The aim of this project was to look beyond achieving higher efficiency. For the Coops, more effective integration meant better coordination and therefore a better chance to work on the quality of the products of the entire supply chain. Information and communication technologies (ICT) were perceived as the vehicle for enabling standardisation in breeding and cultivation, and thus achieving formalisation of best practices within strict protocols. Finally, the documentation and traceability of all phases in the production process were accepted by management as the natural path to achieve the level of quality required from both the modern individual consumer and the *Grande Distribuzione Organizzata*.

The objective of the new system (ICT, people and processes) was therefore to combine and distribute the information necessary to ensure not only the efficiency of the system but also the high quality of the products produced by the Coops. This was to be achieved by controlling the processes of standardisation, formalisation and traceability, as shown in Figure 9.1.

The Coops represent more than 2000 farmers across Italy. These farmers are also special shareholders of the cooperatives; they participate in committees and in management positions as well as casting votes. In short, the farmer-shareholders are the owners of the cooperatives that own Quattro and also the key users (and clients) of Quattro's services.

Accordingly, the mission of Quattro is to provide services to its members that contribute to improving the quality of their work and the quality of their produce. To do that, Quattro, via 4HQ, offers services that can be categorised into two macro-areas: standard services for the supply chain and customised services.

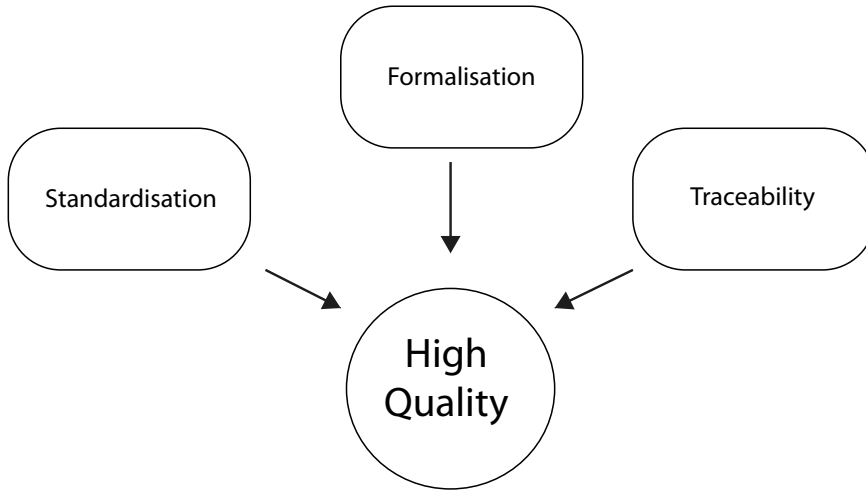


Figure 9.1 Processes Contributing to High Quality at Quattro

Informational Services

The purpose of the first type of service is to support the commercial activities of the participants through an easy, effective and consistent set of communication channels. These services target the information needs along the supply chain. The main tool is a portal that every week publishes relevant information such as new agricultural laws and regulations, protocols, farming products, and so on.

Customised Services

This second group of services consists of the ability to customise services according to the user accessing the 4HQ system. Depending on their identity and access rights, users are able to visit the portal to obtain sector-specific, technical marketing information and links to local businesses. In this category, we find the services such as

- zootechnic consultancy
- traceability information systems
- consultancy in designing and implementing management and control systems
- training and e-learning services
- research project design, coordination and implementation.

Analysis and Discussion of Intuitionism and Modernisation in Agribusiness

The initial goal of Quattro was to use ICT to increase the number of transactions in the supply chain, as the Managing Director of Quattro explained at the time:

In this way, it is possible to provide the companies of the sector with outsourceable support, thus creating a vertical integrated value chain and therefore allowing immediate product traceability and other benefits. The main goal in our mind was to create the new Amazon.com of the dairy industry.

With such a vague goal in mind it is not surprising to see that 4HQ and Quattro evolved not into an 'Amazon.com of the dairy industry' but into something else, by drifting, changing and adapting in a process of discovery and evolution. Nowadays, 4HQ enables a strong integration of the supply chain, from suppliers of raw materials (milk and agricultural products) to food-processing companies. The system connects, informs and provides services to more than 2000 participating enterprises—a network of mainly small and medium enterprises in the agricultural and food industries operating across the Italian territory.

The services most appreciated are those related to traceability. A considerable amount of effort and resources is focused on guaranteeing traceability and quality of the products in the supply chain. Quattro also focuses on developing a technological environment to provide timely and accessible consultancy services to participants, and thus on developing an integrated information system among farmers, cooperatives and clients that adds value to the participant parties and generates revenue for Quattro. The need for traceability is a powerful coercive isomorphic pressure that acts in support of the modernisation process.

The changes introduced by the system are not just technical; the system is changing the way farmers have been operating for a very long time. The introduced changes are forcing farmers to change, and some are more receptive than others to the new ways. One of them stated that those farmers who want to compete in today's business environment 'cannot sell their products any more on the basis of trust and their well-known name'. The new system is replacing a way of living and a source of pride—the pride of being associated with and being known for the quality of what they produce. Here there are coercive pressures supporting the modernisation process while normative pressures linked to trust and fame tend to slow the process.

The globalised market, with its demand for quality assurance, brought along new actors such as the 'certificators' EUROCAP or GLOBALGAP that control the

processes of production in order to confirm certification. Some farmers think that the computers will bring an aura of professionalism and therefore will facilitate the certification.

These certifiers feel more confident if they see that we [the farmers] are using a computer for managing the information about pesticides, fertilisers or phytodrugs and demonstrate that the production process has followed the right production protocol.

The rationalised myth of computers bringing professionalism in their wake is quite widespread and certainly has some leverage. This isomorphic pressure can work in support of the modernisation process.

The second objective of Quattro was to improve the efficiency of the farmers in response to the demands of the *Grande Distribuzione Organizzata*. This aim was not easy to achieve due to the small average size of Italian farms, which makes achieving economies of scale difficult. According to the Italian Institute of Statistics (ISTAT), in 2005 there were 1 728 532 farms in Italy, with an average of 10.4 ha of land, of which 7.4 ha were used for agriculture.

Resolving the Tension Between Members' Approval and Market Demands

One of the roles of the cooperatives is to provide services to their members and yet, due to the cooperative nature of organisation, this is not a typical client–service-provider relationship. The people working in and managing the Coops and Quattro have to take into account, in their service provisioning to member-owners, that their actions and decisions must ultimately be supported by the majority of the members. As a vice-president of one of the cooperatives said:

On one side we don't have independent autonomy. We are representatives of our members; we [the cooperative] were born to serve them. On the other side, we must cope with the rules of the market otherwise the risk of bankruptcy is more than a hypothesis.

In contrast with a traditional corporation, a cooperative has to find equilibrium between two competing demands. Cooperatives act as 'normal' organisations in that they compete on the basis of efficiency and efficacy; however, a couple of extra considerations are very important. First, for production cooperatives (as in our case), their suppliers are also their owners and they therefore cannot pursue maximisation of efficiency and efficacy on the supply side without taking into account the particular social responsibility embedded in the cooperative movement, such as issues of mutual help, solidarity, social values and equality that are so important to their being.

Second, every significant decision, operational or strategic, has to be ultimately shared with and approved by members. The cooperative's board of directors is directly responsible to the members who elected them to the board. In addition, for a cooperative, the rule of 'one head, one vote' means that the strategies and the policies adopted have to be accepted by the majority of the members and reaching consensus is culturally accepted as the correct way to implement change.

Thus, *consensus building* is an important management element to consider, in part because collaboration within the boundaries of the cooperative is a natural expectation and also because initiatives aimed at improving the collaboration capability of the cooperative are (in principle) well accepted. Since consensus from the members is needed to run the cooperatives successfully, the cooperatives must endeavour to control the information flows in order to increase transparency on the condition of the market and to provide relevant and timely information to their members.

When all of this is taken into account, it seems that members should readily adopt a system such as 4HQ since, in theory at least, nobody would reject the services offered by it and there is a broad consensus on its potential value. Despite this fact, we observed that the pace of adoption of 4HQ proceeded slowly among the members.

According to people involved with technical aspects of the system, there are a few factors influencing the slow uptake of the technology, and these factors seem to be mainly related to the characteristics of the users. The 4HQ IT Manager said that, in this environment, ICT systems 'are often too complex to be useful. The lack of high-speed connection, the time and the knowledge required to use the system make the farmer uncomfortable with it.' The chief technical officer of one of the cooperatives responsible for developing part of the system points to the age and lack of computing skills of the farmers: 'On one hand there is the average age of the agricultural entrepreneurs. Most of our members belong to that generation which never used a PC or IT in general.' These claims are partially contradicted by other evidence (ISTAT) showing that, while the phenomenon of the ageing population of farmers persists, younger farmers are in control of the majority of businesses with higher income. Therefore, the supposed lack of ability with computers can easily be seen as a rationalised myth and its disconfirmation shows that the modernisation process could be easier than expected.

When we consider these facts it seems that we are observing a younger and more academically qualified farmer emerging in Italy. Given the 'one head, one vote' rule of the cooperatives, however, the greater number of small farms, perhaps with less computer literate leaders, have considerable voting power within the

cooperatives. Furthermore, while younger farmers seem to be more receptive to the technology and able to persist with the system in order to get the benefits it offers, for the system to be successful wider adoption is required. We seemed to touch again on the barrier of age during an interview with a thirty-four-year-old farmer who said:

I started using the system three years ago. It took a little time to use it properly, but eventually I was able to sort it out. Now I can use it easily. I use the system once a week. It takes from 40 minutes to one hour to fill out all the forms and do the job. It was a little bit tricky, especially at the beginning, and I understand if some of my colleagues, especially the older ones, find it difficult.

This situation is particularly worrisome at a time in which the product of agribusiness is not just the material produce, as one of the vice-presidents lamented:

They [some farmers] think that a bottle of milk is a bottle of milk. Today this assumption is not true any more. A bottle of milk is made of a bottle, milk and all the information related to the production, distribution and stocking processes adopted and printed on the label.

How the Use of the 4HQ Can Provide Great Advantages to Cooperatives and Consumers

Achieving the goal of high quality is perceived as critical to the future of the cooperatives, both in terms of complying with laws and regulations and in terms of satisfying the demands of corporate customers such as *Grande Distribuzione Organizzata*. One of the initiatives is to have an electronic log, an electronic repository called '*quaderno di campagna*' (loosely translated as 'book of practice'), which contains all the information about the processes conducted in the field. A senior manager explains both the nature of and the need for this service:

We are the interface between the farmers and the *GDO*. If the law requires, for example, a maximum of 3 mg per kilo of a certain substance (pesticides), the *GDO* will often require a lower percentage. The amount of residuals will depend on when and how the farmers use these substances. They have to declare everything on the *quaderno di campagna*, which can be filled offline [using paper-based forms] or online. If they use the offline version it is possible that they might make a mistake—for example, writing the wrong name for the product or declaring a quantity which is inaccurate. Once a season, we collect and check all documents. This means that we can handle the problem only

when it is too late. With the online version, we see in real time what the farmer is doing. He cannot mistake the name of products, due to the prompts the system provides. If he enters something incorrectly, we can contact him immediately and organise a proper response.

The previous quotation encapsulates both the need for and the complexity of a system in which choices (that is, doing the work offline or not at all) can jeopardise the cooperatives' attempts to reform their operations. The management of the cooperatives clearly believe that, as the agricultural industry faces an increasing level of pressure to obtain high quality of product, service and information, they must modernise or perish, and that this goal can be largely attained through a process that calls for the following:

1. *Standardisation of production procedures.* The farmers must standardise their procedures in order to be compliant with the law and protocols established by institutions, markets and governments.
2. *Formalisation of the distribution phase.* The process of distribution should be conducted in a manner in which verification and traceability are possible. This formalisation will fulfil the final client informational needs, presenting important consumer information in an accurate, relevant, standardised and specific manner.
3. *Coordination as integration among the actors.* Because of the high level of interdependency among all phases of the supply chain, the actors must be efficiently and effectively coordinated. The overall quality of the industry depends upon ensuring reliability and proper controls at each step of the supply chain. The easiest way to obtain this is to trace every step of the supply chain through sharing, validating and integrating all the necessary information.

Finally, the implementation of the 4HQ platform requires not just a good technical solution but also a significant modernisation process that takes into account the needs and culture of the farmers and not just the cooperatives' rationale for change.

Conclusion

Unlike a traditional corporation, a cooperative must deal with maintaining the equilibrium between respect for their long-established institutional social contract with the members and the efficacy and efficiency required by the market. Our chapter has described one significant initiative that addresses the need of an economically important group of cooperatives to respond to market and regulator demands for traceability, quality assurance and efficient practices.

The reported phase of the study focused on the rational reasons for the initiative, as perceived by the management of the agricultural cooperatives, in an under-researched area of management and information systems. The study highlights tensions between the very nature of the cooperative enterprise and their need to adapt and respond to pressures from a fast-changing environment. Our main contribution lies in understanding both the external pressures and the organisational response through a modernisation attempt—an evolutionary change that would, if successful, allow the organisation to prosper.

We have, so far, come to only partial conclusions. Institutional theory has been useful to highlight certain contrasting elements but we acknowledge that our analysis is just at the beginning. There is a need to further investigate how farmers respond to changes in practices that in some cases will replace longstanding institutions. Therefore, our next study will endeavour to understand the reasons for delayed adoption, focusing on understanding the behaviour and concerns of the non-adopters (who are under-represented in the current study) and how these behaviours and concerns can be addressed in the context of the agribusiness cooperatives.

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