Public acceptance of automatic milking

Literature review on acceptability of and public opinion on automatic milking systems

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Information

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Abstract

The overall success and longevity of the milk robot as a technological innovation will not only be determined by the fact that it is economically profitable, technologically sound and user-friendly but also by the possibilities of gaining a positive image and of being accepted by the general public – consumers. To come to a better understanding of the dynamics involved in this process, the first phase of the project consists of an international and multidisciplinary study of the relevant literature. An initial analysis led to the identification of some key perspectives on the topic.

First, the interpretation and acceptance of the use of milk robots in dairy farming must be understood within the context of contemporary society. Post-industrial society is characterised by hyper-rationalisation and the overall application of ever more advanced science and technology. While technological innovation expands the domain of choice for consumers and potentially improves living standards, it also leads to an undermining of scientific and technological certainties and to the establishment of 'counter movements' such as the environmental, consumer and animal rights groups, which seek to counter-balance the assumed positive consequences of this hyper-rationalisation. This is particularly clear in the area of food production and consumption. Here, the growth of the agro-business has been accompanied by consumers who, struck by gastro-anomie, increasingly revert to non-processed, non-industrially produced food. Potentially, this is an important aspect of opinion formation with regards to the industrial milk robot.

Second, the report takes a closer look at the processes and agents through which public opinion is formed within this societal context. Particularly in the area of scientific and technological developments of which the general public has little direct knowledge (such as the milk robot), the mass media take up an important function in agenda setting and framing. More than specialised press or opinion leaders, the mass media act as a source of possibilities and guidelines for what people talk and think about as well as for the way in which they talk and think about it. Public beliefs in this regard tend to correspond to the messages conveyed in the media, even though the direct cause and effect relationship is unclear. One finding is that media reporting on technological innovations such as the milk robot is not restricted to the 'science' section but can equally be found amongst political or lifestyle news. Of a particular nature is the relationship between journalists and experts. Although they differ in opinion regarding aspects such as 'accurate' reporting, they do tend to develop some 'symbiotic' relationship, which is of influence in the way the topic is covered. Of even greater importance with regards to public opinion formation is the fact that, both in terms of information seeking and reporting, the media seem to display a marked preference for news and coverage centred around dramatic, negative and controversial events. To a large extent: 'good news is no news'. These findings need to be taken into consideration when trying to understand the likelihood of public acceptance of the milk robot.

Finally, the importance of a pro-active approach towards information and communication regarding the new technology is evaluated. Research shows that people tend to believe low-credibility sources just as much as high credibility sources. Moreover, in areas where the audience has little pre-existing knowledge, the media function as the major sources of information and the major definers of the situation. In this respect, a pro-active approach to providing information about the new technology seems relevant. This communication with the media should not restrict itself to specific information about technological, economic and other aspects of the technologies at hand. It should also seek to manage issues which can become relevant news items for the media. In respect to the milk robot, certain issues relating to consumer protection (eg. quality of the milk) or animal rights (eg. keeping cows indoors) can be potentially detrimental to the image of the equipment and thus even of the entire sector. Being sensitive to these issues and dealing pro-actively with them, can help to establish a positive view with regard to the milk robot and contribute to its widespread public acceptance.

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Introduction

The factors determining the long term viability of the milk robot go beyond its mere technical merits and applicability, its economic consequences and even beyond its acceptance in dairy farming and industry. The overall success and longevity of the milk robot will be determined in equal measure by public opinion and public acceptance of this new high-tech diary farming device. Indeed, as has been witnessed in the past, technological and scientific innovations which have proven economically profitable, technologically sound and user-friendly, can still obtain a negative image, being judged unfavourably by public opinion and thus end up being rejected by the general public. Examples can be found in diverse sectors such as consumer durables, electronics, the food industry at large and the diary industry in particular (cf. BST, see o.a. Ceas Consultants, 1989; Schmidt & Richter, 1991; Van Berkum et al., 1996).

Compared to the beef or poultry industry, the diary industry scores favourably with the general public (cf. infra). In addition, the milk robot has some proven advantages, not only for the dairy farmer and the farm animals, but also for the consumer. As such, the milk robot should achieve a positive image and should be easily acceptable to the general public. Yet, matters of public opinion and public acceptance are far more complicated than that, involving much wider societal processes and structures and many more actors than just those immediately concerned with the diary industry. In this respect, the mass media are key players.

To come to a better understanding of the dynamics involved, the first phase of the project consists of an international and multidisciplinary study of the relevant literature. The aim is to bring together and critically assess the theoretical perspectives and findings of previous studies with respect to the factors and conditions stimulating societal acceptance of, or resistance to, new technology in general, and developments in agricultural and diary production in particular. In particular, the role of the mass media as a core factor is studied.

An initial analysis led to the identification of some key perspectives on the topic. As a result, we will first contextualise the project in the study of contemporary society as dominated by technological advances. This relates to technology and science changing society as well as to society at large responding to new technologies. It also draws attention to some key characteristics of contemporary society which are vital to our understanding of today's consumers. This will be complemented by a study of how technological and other developments in the food chain and in food processing, affect society and its consumers and how the latter respond to it. This section will be concluded with a more in-depth look at the position of the diary industry (and the milk robot) in this societal context.

Second, we take a closer look at the 'construction' of public opinion. What is public opinion? How does it 'function' in society? And what exactly is the all-important role of the mass media in public opinion? This will include a look at the way the media deal with new technologies in general and food related issues in particular. What is known about the coverage of new technologies and related issues

in the media? How extensive is it? How and in what ways (positive / negative, investigative / superficial, specialised / popularized) do the media cover this area? Where do media get their information from? This can provide vital lessons for the way the milk robot can and will be dealt with in the mass media and, consequently, how public opinion on and acceptance of this new technology will be influenced.

Finally, we will look at the possibilities for the industry to influence public opinion regarding new technological developments and food related issues. This area centres on the role of PR, lobbying… and the media. What is important in the relationship between, on the one hand, the media and, on the other hand, PR and lobbyists from the industry? Is there a need for pro-active initiatives on the part of the industry?

The study of the literature in these different areas should provide us with a better understanding of the processes involved in the acceptance of new technologies in the food industry in general which, in turn, will provide interesting lessons in relation to public opinion on and acceptance of the milk robot. Although the milk robot was first introduced almost ten years ago now, very little has been written about it in terms of the questions at hand. We therefore expand our perspective to learn vital lessons from a wider but related field. In the light of recent food scares (e.g. salmonella in eggs, BSE, foot and mouth,…) it is important to distinguish our topic from these scares, the handling of it by the media and the impact on public opinion. Food scares are, by definition, negative events, resulting from the fears inherent in contemporary risk society as much as from factual contaminations. We want to clearly distinguish the problematic of the acceptance of the milk robot from these negative experiences as, firstly, it is unwise to situate a new technology ‘by definition’ in a problematic context and, secondly and more importantly, because the dynamics involved in food scares differ considerably from the ones that accompany the introduction of a ‘healthy’ new technology in the diary industry.

1 Contemporary consumer society, technology and food

To understand why and how society at large and individual consumers would or would not – under certain mediated and other circumstances – accept the automatic milking process, one must first put the problem in its wider sociological context. Technological advances in the farming industry are not new and are part of a much wider social dominance of science and technology. The evolving way in which society operates within and deals with this scientific and technological dominance in general, and in the sphere of food in particular, is the first major angle from which to understand the specific problem at hand.

1.1 Contemporary society

1.1.1 Rationalisations and Functional-Structural Differentiation Over Time

Modern Western societies have been characterised, among other things, by a process of rationalisation (cf. Locke, 2001). The victory of Reason over religion and tradition – a result of the Enlightenment – led, according to Weber (cf. Crook et al., 1992), to a situation where ever more spheres of life are characterised by a growing rationalisation. Tradition and intuition make way for formal rationality and ethical rationality is replaced by instrumental rationality (Crook et al., 1992: 8). The differentiation between spheres of life is accompanied by the creation of a rational basis for the different fields, and as structural-functional differentiation increases, so does rationalisation. This can be witnessed in the growth of Western capitalism as a 'rational' economy, a political life based on rational laws and procedures, a secularised and materialistic-instrumental culture dominated by ever more refined scientific and technological rationality (Bocock, 1992: 257). In industrial society, science and technology begin, according to Giddens (1998: 31-2; see also Giddens, 1991), to function as a tradition in their own right. Meant to overcome tradition, scientific knowledge becomes a taken-for-granted authority. It is something which most people respect, although it is external to their lives. Lay people 'take' opinions from the experts - although Wynne (1996: 58) underlines the importance of lay knowledge.

As society evolves into what is now called a reflexive, consumer society, characterised by hyper-rationalisation and hyper-differentiation, so opinions on science and technology evolve. Durant (1998: 71) gives a clear account of this transition in the views of society on science and technology. He explains how those born after WW II grew up in a climate of extraordinary optimism about science and technology:

> The period from 1945 to 1965 was the heyday of deference to the scientific expert. He (it was almost always he) was the architect of astonishing new discoveries – jet-powered aircraft, atomic power, antibiotics – which were bound to make the world a better place. (…) This was

> the time when science was generally regarded as the consumer's friend. In the early days of commercial advertising on television, white-coated experts happily endorsed the latest kitchen gadgets, washing powders, toothpaste and patient medicines. In the high street, the endorsement of the laboratory scientist was an apparently automatic seal of approval, a guarantee that products where not merely new but somehow improved. If science said something was good for us, then it *was* good for us.

Since the late 1960s, several elements have undermined this (modernist) deference to science and technology. The instrumental success of science and technology, for one, backfired on the reputation of science. Disarmement movements are an early example hereof. There was also a growing awareness of the downside of civil research and development, which let to the early environmental movement's protest against pesticides and pollution. Durant (1998: 71) illustrates this shift, saying that 'while in the 1950's, civil nuclear power had been a symbol of scientific and technological progress, by the 1970's, it was widely opposed as a symbol of all that was wrong with so-called advanced industrial society'. In contemporary, consumer society, then, the old 'scientific and technological certainties' can be seen to have disappeared. The hyper-rationalisation of recent times has thus let to a depreciation of rational science and technology itself. There is much less deference towards science and technology which are no longer simply regarded as a source of solutions, but increasingly as part of the problem.

1.1.2 Multiplicity, Choice and Anxiety

Contemporary consumer society is characterised by pluralisation and multiplicity. For the consumer/individual choice is abundant. If an item or activity can be represented as 'new', its appeal probably increases. Newness is a property which promises excitement and adventure for individuals and progress at the institutional level. But constant innovation has its disadvantages. As Wade explains (1997: 57-8):

> Perpetual change causes social and personal disruption. People come to feel insecure and anxious. New practices or products might prove unsatisfactory, might give fewer rewards than those being discarded. Worse, the new might prove positively dangerous, but once introduced it might be impossible to restore prior conditions.

This has been described by Berman as the paradoxical experience 'to find ourselves in an environment that promises us adventure, power, joy, growth, transformation of ourselves and the world – and, at the same time, that threatens to destroy everything we have, everything we know, everything we are' (Berman, 1983, cf. Bauman, 1988, 1991; Beck, 1992; Giddens, 1991, Martin, 1981). In response to the novelty aspect of contemporary consumer society, many revert to tradition. Established conventions, proven procedures and well-tried practices carry appeal for many people. In the face of the cult of the new, some people seek authentic or shared sets of customs that can be protected, defended or reproduced (Warde, 1997).

This aspect of contemporary society influences the position of science and technology. On the one hand, science and technology have, more than ever before, become part of our lives. Giddens (1998: 30) underlines that, on a positive note, technological innovation usually expands the domain of choice as does the disappearance of tradition. But new technology also enhances the above-mentioned paradox. As customary ways of doing things become problematic, people must choose in many areas which used to be governed by taken-for-granted norms. Eating is an example: there are no traditional diets anymore. Beck (1998: 13) underlines that as knowledge and technology race ahead, consumers – individuals are left behind 'panting in ignorance, unable to understand or control the machines we depend on and so less able to calculate the consequences of their going wrong'. Politicians too are lagging behind rather than influencing the goals of technological development. Legislation (on national or European level) is usually in support of them in order to protect the country/region's economic future and jobs. Industry possesses a double advantage in its autonomy in investment decisions and its monopoly over the application of technology. Thus the division of power leaves the industries with the role of primary decision-maker, without responsibility for risks to the public. So society becomes a laboratory where seemingly nobody is responsible for the outcomes of experiments (Beck, 1998: 15).

On the other hand, the pluralisation of society has meant a pluralisation of science with contesting views between scientists and between expert views and lay people. As such, most of us – including government authorities and politicians – have, and have to have, a much more engaged relationship with science and technology than before. We cannot simply 'accept' the findings which scientists produce, if only because scientists so frequently disagree with one another. There has thus developed a much more sceptical attitude to science and new technologies.

As a result, there is a double dialectic at work these days. On the one hand technology has permeated contemporary society through and through, making ever more aspects of life increasingly complicated and incomprehensible to the consumer. On the other hand, the 'status' of science and technology has declined considerably. As Franklin (1998b: 5) states, we have come to recognize through experience that we can no longer rely on experts to guide us in the choices we make. A clear example hereof is the movement of environmentalism (cf. Szeszynski, 1996, see also Douglas & Wildavsky, 1982) and the increasing confidence with which pressure groups such as *Friends of the Earth* and *Greenpeace* contest scientific evidence on environmental issues. It is equally evident in the increasing assertiveness of the consumer movement, giving the consumer a helping hand in the ever more opaque world of consumer good ingredients and modes of production, raising an ever louder voice in the fight against unethical production practices or the misleading of the consumer (cf. Friedman, 1991. Tixier et al., 1979).

1.2 Food production and consumption in industrialised and consumer society

1.2.1 Food production in post-industrial society

The way in which food reaches the plate of the consumer is now a far cry from the self-sufficient ideal of subsistance agriculture. The production process is highly differentiated, with farming representing merely one stage in the complex and frequently lengthy chain of activities which stretch from 'seeds to supermarkets' (Newby, 1985: 31). Mennell et al. (1992, see also Goody, 1982) make clear how food technology has had a tremendous impact on societies, an impact felt across the entire range of production, distribution, preparation and consumption of food.

Food technology is as old as human food production and preparation (Mennell et al., 1992: 68-74, see also Farrer, 1983; Van Otterloo, 1990; Sorj & Wilkinson, 1985). As far back as the The hunters and gatherers' bow and arrow, we can see how people invented and improved techniques to extract food from nature. When people became sedentary, techniques for crop growing and dairying were developed as well as ways of conserving food surpluses. The making of curds, yogurt, cheese, butter and the smoking, drying and salting of meat and fish are referred to as examples. Thus we see throughout history a slow but steady expansion in technical knowledge and ability to ensure stable food supply. With the arrival of industrialisation in the 19th century, though, these developments underwent a rapid acceleration. In several European countries, North America and Australia, the industrialisation of food production (on the farm as well as in the factory) took off.[1] These were instigated to an important extent by the rapid development of scientific knowledge, as developments in chemistry, biology and physiology in the early 1800's led to various types of specialisation. It also helped the start of the sciences of nutrition and microbiology. These and other developments were instrumental in finding out the exact composition of foodstuffs and the micro-processes leading to their growth and decay. A first level mechanisation (tractors, artificial fertilisers and pesticides) led to structural changes ensuring much larger harvests. Techniques of food processing and preservation were perfected. These and further scientific and technological (mechanic) developments, led to the establishment of giant food companies where 'artisan production of flour and bread, the preservation of meat and vegetables and the making of butter and cheese were replaced by milling, baking, canning (later followed by freezing) and milk and dairying industries' (Mennell et al., 1992: 70). Margerine is the most referred to example of an early triumph of food industrialisation but was followed by many others (Goody, 1982: 154-74; Oddy and Miller, 1976; Sorj & Wilkinson, 1985; Stuyvenberg, 1969; Teuteberg 1992). Another consequence of the growth of food technology was the enactment of laws against food adulteration in the late 19th, early 20th century, in conjunction with centralisation and bureaucratisation (cf. Ellerbrock, 1987; Winkler, 1985).

[1] Mennell et al. (1992: 68-70) describe three main industrialisation processes in the area of food, relating to production, distribution (cf. Teuteberg, 1987; Levenstein, 1988; Oddy and Miller, 1976) and consumption (cf. . Here only the first process will be discussed.

Several key authors point to changes since the 1950's (Mennell, et al., 1992; Merill, 1986; Newby, 1985; Pyke, 1970, 1972) which form both an acceleration and transformation of developments.

The postwar period witnessed a considerable transformation in the structure of food production whereby agriculture has been drawn into the embrace of a much wider complex of industrial companies involved in the provision of farm inputs (mainly machinery, processed foodstuffs and agri-chemicals) and the processing, distribution, marketing and retailing of farm inputs. Structural differentiation and segmentation of these and other functions into a 'food production chain' has been followed by vertical and horizontal forms of integration in order to create forms of unitary corporate control 'from seedling to supermarket' (cf. Merrill, 1976). This can be seen to have taken place in the dairy industry just as much as in other sectors of food production. It is this rise of corporate agriculture that has not only prompted the increasing rationalisation of agriculture, but the growth of a food production system, only a small proportion of which may actually take place on farms. Product differentiation and innovation is the motor behind this ongoing development, which is also tightly bound to economic circumstances. In the diary industry too, this can be witnessed in the every growing diversity in milk and diary products. In all sectors of food production, the ingredients of new foodstuffs are more and more derived by synthetic means, which makes them less recognisable as original products of the farm. The growth of technology and – since the 1980s – of biotechnology applied to plants and animals has been substantial. The milkrobot itself can quite easily be interpreted as a step in this development in the dairy industry. It is the result of a rationalisation process in milking and of the advanced mechanisation in the diary production industry.

The implications of all these developments for the production, distribution and preparation of food can be summarized in the following tendencies:

- The rise of agro-business and other global food networks;
- Increase in additives and convenience food;
- Proliferation of bio-industry;
- Change in Western consumption from vegetable to animal foods whereby the raising and holding of stock became subordinated to industry.

These developments have brought the food industry under increased scrutiny of the consumer movement and the animal rights movement (cf. Garner, 1997; Jasper & Nelkin, 1992; Regan & Singer, 1989). The latter in particular has gained importance in relation to notions of ethical farming and the treatment of farm animals. Issues such as battery-hens en box-calves (of importance to the milkrobot, cf. infra) take prominence as farm animals are increasing perceived to be victims rather than beneficiaries of new techniques.

1.2.2 The Food Consumer: The Raw and the Cooked Reversed?

The characteristics of contemporary consumer society in general and of food production in particular, have considerably influencd contemporary food consumers. It seems that our food preferences, our 'tastes', are totally unable to give us any sound, reasonable cues as to what we should decide to eat. What has happened to our nutritional wisdom? Here we need to look at food habits, social change and the nature/culture dilemma (cf. Fischler, 1980; see also, Fischler, 1988; 1990). This angle too can bring interesting insights to the understanding of public acceptance of food produced through advanced technology such as the milkrobot.

In our society, an ever increasing number of people have become mere consumers, that is, they consume foods they have not helped produce, or even *seen* being produced. As a consequence, their perception of food is modified. Contemporary ordinary supermarket food products tend to acquire some mysterious, alien quality. As these foods are produced industrially, out of sight and with sophisticated technology, they are capable of fooling the senses of the most perceptive consumer. The result is a growing diffidence about products of the food industry, related to what Paul Rozin has termed the 'omnivore's paradox' (Rozin, 1976, 1998; see also Falk, 1994, Wade, 1997). The omnivore's paradox consists of a 'double bind'. To the omnivore, any new food is a potential danger but, at the same time, new food is necessary to adjust to new situations and maintain a wide enough range of diet, a diet which is under permanent development. Thus, consumers suffer from a combination of both neophobia, conservatism, and neophilia, curiosity towards potential new foods.

Martin (1981: 16) relates this phenomenon back to the indivdual's loss of social embeddedness in contemporary society, and sees it as an expression of the contradictory imperatives of novelty and custom. According to Fischler (1980: 945-6), contemporary society develops in such a way that it tends to *increase the anxiety of the paradox instead of regulating it*. Fischler (1980: 940) refers to Mary Douglas (1966; 1979) who has shown that the notions of purity and pollution (and consequently the borderline between edible and non-edible) are rooted in our culture's specific cosmology and the kind of taxonomy it develops and imposes. Such taxonomies have little in common with scientific classifications.[2] Nevertheless, they are often remarkably resistant to change, even if it implies negative nutritional consequences. And Fischler explains this further.

Traditionally, raw foodstuffs had to be civilized in order to become fit for consumption - cf. Levi-Strauss's semiotic distinction between 'the raw' and 'the cooked' (Levi-Strauss, 1970). As the cook's task is ever more transferred to industry – from the kitchen to the factory – (industrial) processing no longer seems to guarantee symbolic purity. Rather, it seems to breed symbolic danger, a fear no longer for biological corruption or putrefaction, but rather for industrial processing, chemical additives, excessive processing, etc. As Fischler explains, refined foods, which we were craving for until recently, are now rejected for nutritional, (white sugar = 'empty calories') and/or symbolic (refined

foods are 'artificial', or 'dead') reasons (Fischler, 1979a). 'White, the triumphant colour of the sixties (white sugar, white bread, white veal, white laboratory-like kitchens, white blouses in the supermarkets etc) is no longer cherished. The time has come for brown bread, brown suger, gray flour, pink veal'(Fischler, 1979b). What we see now is the victory of the raw over the cooked. Food goes 'natural' and 'organic'. Here we see a clear example of how, as mentioned above, contemporary hyper-rationalisation leads to a negative rather than a positive attitude towards rational science and technology.

A primary result of this crisis of gastronomy is a state of *gastro-anomie* (Fischler, 1980:949). Modern individuals are left without clear socio-cultural cues as to what their choice should be. Food selection and intake increasingly become a matter of individual, not social decisions, and they are no longer subject to ecological or seasonal constraints. However, since individuals lack reliable criteria to make these decisions, they experience a growing sense of anxiety. The very codes or structures governing eating habits have undergone a process of 'destructuration' (Fischler, 1990: 203-7). A shift is occurring in what contents our culture ascribes to the categories of purity and pollution. In this sense, the current growth in demand for symbols of nature could be interpreted in terms of a response to and reaction against the increasingly serious problems we face in *identifying* our food.

Consequently, it is not surprising that these popular thoughts about food and health are also to be found in 'alternative' or 'counter-cultural' worldviews and corresponding lifestyles (Mennell et al., 1992: 45-46). Studies reveal that modes of living which seek to 'recover' a natural purity held to be under threat by the artificiality of over-civilised modern urban life, lead to the avoidance of selected, or all, animal products; a repugnance for modern stock rearing techniques; a suspicion of 'artificial' food additives and of the modern use of agricultural fertilisers and pesticides; and a generalised ecological, 'green' sensitivity (Atkinson, 1980; Roth, 1976; Whit, 1988; Kandel and Pelto, 1980; Van Otterloo, 1990; Twigg, 1980). Modern vegetarianism is obviously one of the best know examples (cf. Amato and Partridge, 1989, Farrer, 1983, Millstone, 1986, Belasco, 1989; Lacey, 1989, 1991). These alternative views though also permeate wider public opinion on food issues. For instance, the recent (British and wider European) food scares widened public distrust of modern food production techniques (cf. Sellerberg, 1991a), with the media playing a vital role in heightening public anxiety (cf. Beardsworth, 1990; Gofton, 1990, Smith, 1991, cf. infra).

[2] In some cases, it is even the human genotype which seems to have adapted to cultural or eco-cultural conditions. A good example is that of lactose tolerance, which may well be an adaptation to pastoralism (Kretchmer, 1972, Simoons, 1970).

1.2.3 Discussion: Position of the Milk Industry and The Milk Robot

The high-tech milk robot can be seen as a very clear exponent of the hyper-rationalisation that has hit the dairy industry as much as any other sector of food production.

At the level of food production, the dairy industry has a relatively positive image. Dairy farmers are seen as modern entrepreneurs, who work hard and take care of the landscape and of their animals (Tegels, 2001: 13). Milk production, despite its *de facto* industrialised nature, is still seen by the public at large as a reasonably 'natural process' in which the negative elements of industrialisation have not yet taken their toll. So, in the light of contemporary criticisms of hyper-rationalisation in society at large and the food industry in particular, the diary industry's position is quite strong and positive. Particularly in relation to issues of animal rights and ethical farming, the diary industry scores well. The seemingly simple notion of 'seeing cows grazing in the field' attributes to the positive image of the treatment of animals on dairy farms.
These elements are of core importance to the potential success of the milk robot with the wider audience. As a Dutch enquiry of opinion leaders makes clear (Tegels, 2001), the positive impact of the fact that the milk robot is overall a farmer and animal friendly instrument, can be undermined by its high-tech nature which goes against the view of the 'natural process' of milking. The milk robot scores high on animal welfare as, among other things, it reduces the stress of the animals (cf. Hopster & van der Werf, 2001). At the same time though, the issue of cow grazing is of significant importance here. One of the potential 'dangers' of the widespread introduction of the milk robot is the tendency for cows to be kept indoors all year round (Jagtenberg & van Lent, 2000; Van der Schans, 2000; Zonderland & Vellinga, 1999). As the positive image of the dairy industry is partly based on the fact that people appreciate the view of 'cows grazing in the field', this could have a very negative impact on the image, not only with animal rights activists, but with the public at large. As such it may well impede on the overall acceptance of the milk robot.

On the side of the consumer and consumption too, matters can become complicated. Research over the years shows a mixture of consumer attitudes towards milk (Ackerman et al., 1981; Casewell et al., 1996; Fischler, 1985; Holmes, 1982; Nash, 1985; Termorshuizen, 1982; Vandercammen et al., 1987; Wright, 1987; Unecolait, 1981; X, 1995). On the whole, milk has quite a positive image with the consumer. It is considered an important source of food, of good quality and of health. It's image has a strong traditional element closely related to a sense of naturalness. In that respect, it fits in very well with the above-mentioned return to the 'raw', resulting from a move away from the hyper-rationalisation in society at large and the food industry in particular. In that respect the partial shift in consumption towards (semi-) skimmed rather than full (and as fat-rich perceived) milk can also be attributed to the consumption pattern of 'health food enthusiasts' and 'weight-watchers'

(Vandercammen et al., 1987: 16). In this respect, if the milk robot is openly interpreted as a form of the hyper-rationalisation of milk production, it can have a harmful effect on the appreciation of milk as a 'natural', 'traditional' product and thus seen as part of the problem rather than part of the solution.

On the other hand there are certain negative aspects to the image of milk as a consumer product. It is often considered as no more than an adjunct to other food or drinks or as an ingredient in cookery rather than as a drink in its own right. Particularly with young people it is often seen as an old fashioned product with a goody-goody image, with strong relations to childhood. In purchasing considerations, quality and taste are much more important than price. It is also perceived as being easily contaminable, potentially a prime recipient for all the chemical and toxic by-products of modern agro-industry processing. Here again, the milk robot has the potential to be both beneficial and harmful in respect to the image of milk. On the positive side e.g., is the fact that the milk robot allows for automatic health checks with the cows, thus providing strict control over the 'healthiness' of the milk. On the negative side, the questions raised regarding the quality of the milk, can rub off on the image of the milk quality as a whole. In the light of the current situation of gastro-anomie in which contemporary consumers are seen to be, these elements have to be given careful consideration.

2 Public opinion and the general mass media

The success of the milk robot is not only dependent on its technological perfection and practical applicability, but also on its acceptance by 'the general public'. Consumers and society at large have to accept and even think favourably of the milk robot and its uses in the dairy industry. This brings us to the ubiquitously used but difficult to grasp notion of 'public opinion', how it is formed, who determines and influences it. Although we cannot and will not discard the influence of politics or of opinion leaders, it is undeniable that their influence is mediated by the mass media. Indeed, social scientists have long assumed that the way media deal with issues, including (food related) science and technology, influence the way individuals and the public at large think about and behave towards these issues, although views on their actual degree of influence have differed. There seems to be general agreement that the mass media constitute a major forum of the public sphere in modern societies and that the mass media are enormously influential, but there is much less agreement about the exact nature of this influence (cf. Gaskell, Bauwer & Durant, 1998). A considerable body of literature deals with such questions as: what images of science and technology do the mass media provide? What is the effect of such images? How do audiences respond? Do (food) science and technology journalism and wider media references to them, in fact shape, or even create, public attitudes – or do they simply mirror them? The images of science and technology are often shifting, reflecting current fashions and prevailing fears. Today's exaggerated promises – of new fixes, new devices – become tomorrow's sensationalized problems (cf. Peters, 1995). This will be discussed below.

2.1 Public opinion, aggenda-setting, framing and the media

The starting point then is the ideal of 'public opinion', 'public sphere' and the role of the media herein. As Nelkin (1995: 64-5) demonstrates, in the 1920's, social scientists and observers such as Cooley and Lippmann began to focus considerable attention on the mass media's power to shape public opinion. In the late 1930s, a growing number of studies challenged these assumptions, suggesting that the mass media (mainly the press at the time) were seldom the direct source of attitudinal or behavioural change. During the mid 1950s, however, analysts began to argue that Western societies had become mass societies, characterised by the isolation of individuals. They believed that the declining importance of primary groups, i.e. of the close knit relationships of family, friends and neighbourhood, enhanced the direct influence of the mass media. In the 1960's, ideas changed again. Mass media were believed to contribute to, but not be the primary cause of, the public's attitudes and ideas. The effect of mass media messages, people like Klapper argued, depends on the social context in which they are received. This perspective was to shape the assumptions underlying the subsequent media research. Many factors enter the reader's social context, including the cumulative influence of past media

images, various alternative sources of information and imagery such as peer groups, opinion leaders, government campaigns etc.

Other central findings include, first, the fact that although people seek information from the media to guide even the most personal decisions, they use such information mainly when it corresponds to their prior views and inclinations (Nelkin, 1995: 72). Second, a more general effect of media coverage is the agenda setting function of the media (McCombs & Shaw, 1972; Cohen, 1963; DeFleur & Ball Rokeatch, 1989; Lowery & DeFleur, 1988; Lyengar & Kinder, 1987; Murdock, 1974; Tuchman, 1978; Weaver, 1984). It has become generally accepted that a congruence exists between the order of importance that the media assign to specific issues (thus legitimising them as public issues) and the order of importance attributed to the same issues by the public. The issues and events that receive a greater degree of media attention become the issues and events that are uppermost in the audience's minds. In other words, mass media largely define attitude objects and situations to be perceived by the masses as relevant or important. The congruence does not necessarily imply a causal relationship between distinct rank orderings of issues or agenda's; they may interact in a much more complex way. But the media do seem to be particularly influential in making some issues more salient than others. Agenda-setting is closely related to the idea of framing. The media make problems visible and define a 'frame' within which they can be interpreted (cf. Gaskell, Bauwer & Durant, 1998; Splichal, 1999). In other words, they establish a framework of expectations. In particular since contemporary societies cannot provide clear normative guidance in uncertain situations, people are escpecially in need of information regarding how to co-ordinate their actions and about means and opportunities for making up their minds about issues (cf. Splichal, 1999: 276).

2.2 Public opinion, technology and the media

For most people the only contact with information regarding technological innovations such as the milk robot is what they are confronted with via the media. As Nelkin (1995: 2) states: 'the media are their only contact with what is going on in rapidly changing scientific and technological fields, as well as a major source of information about the implications of these changes for their lives'. Both on an individual and on the community level, people are continually confronted with choices that require some understanding of technology. Media can play a role here. Public beliefs about science and technology tend to correspond with the messages conveyed in the media, though the direction of cause and effect is not clear. Yet, still according to Nelkin (1995: 68-9), there is not one single relationship. Despite the interest expressed in media coverage of science, the actual influence of the media on beliefs and behaviour varies with the selective interest and experience of the audience. In areas where the audience has little direct information or pre-existing knowledge, the media function as the major

source of information, defining the reality of the situation for them. Conversely, when the audience already has an established set of beliefs, coverage tends to reinforce these. And when the audience has had personal experience or long term exposure to media coverage, the effect of media images is tempered by prior attitudes regarding the issues.

Hornig (1993: 97) claims that there are special problems associated with media reporting of science and technology, particulary in relation to potential risks. For example, non-technical ('lay') publics have difficulty distinguishing between mainstream and fringe opinion on scientific matters. At the same time, research has shown that low-credibility sources may be as influential as high-credibility sources. In fact, Mazur (1981) has demonstrated that any media coverage of scientific controversy, whether positive or negative in tone, is followed by negative public opinion. By focusing the public's attention on a risk issue, no matter what is actually said about it, the media may be inviting their audience to be concerned. Given that only controversial issues tend to be covered, the finding that a rise in coverage is associated with a rise in public concern is itself unremarkable. From her own research, Hornig (1993: 106-7) further concludes that public concern about technological risk does not depend heavily on numerical representations of the probability of harm but rather on attention to ethical considerations, judgements about effects, or concerns over how science and technology are used.

Dickinson (1998: 256), studying media coverage of food in particular, came to the qualified conclusion that the media's role in representing a social issue or topic must be understood as a source of possibilities, guides, or recommendations for social behaviour rather than in terms of impact, influences or effects. Moreover, he shows how television contributes to decision-making about food by offering solutions to the dilemmas viewers confront as a result of their confusion over which foods might be beneficial or which might be dangerous to their health, which foods may be a source of pleasure or which they may dislike. In this way, television, like other mass media, is an agent for the reduction of anxiety and the creation of trust (cf. Silverstone, 1994).

2.3 Media content on food and new technology

Content analysis of media coverage of science and technology in general and food related issues in particular, is scattered and there is little uniformity. Still, some interesting and useful results can be summarized, and from them some general lessons of importance to the understanding of the media's impact on the acceptance of the milk robot, can be learned.

The coverage of new technologies and scientific 'discoveries' has varied over time (Nelkin, 1995: 9-10). The 1960's was a period of scientific and technological 'breakthroughs' and 'revolutions'. 'The man on the moon' and the dramatic discoveries in the physical sciences were covered with wonder and elan. The frame changed in the late 1960s and the 1970s, when wonder gave way to concern about

environmental and social risks. In the 1980s the technological enthusiasm of the 1960s returned, though tempered by the continued fear of risk. The idea of progress was reinstated as innovation, and the celebration of technology turned to a high-tech hype. The hype continued in the 1990s, although it focused more on the biological than the physical sciences. Today, the economic costs of huge science and advanced technology projects, the ethical and environmental implications of research and technological change, and fraud are an important part of science and technology news. There is today more critical and negative reporting about science and technology in the media. The result is that while there is more science news in the media every year (cf. Lewenstein, 1987), public understanding of science and technology is in many ways distorted. The reason is, still according to Nelkin (1995: 7), that while we welcome technology as the key to progress and the solution to problems, we are increasingly preoccupied with risk, fearing the very technologies we most depend upon. This goes back to the above-mentioned uncertainty in society regarding hyper-rationalised technologies in general and the gastro-anomie with regard to food in particular. As we have seen, the milk robot fits right into this gastro-anomie.

In a similar vein, Peters (1995:31-2) reports on his long term content analysis of German media science and technology coverage. He points to an increase in coverage of technology and its consequences since the mid 1970s, accompanied by an increase in the relative proportion of statements critical of technology (cf. also Kepplinger, 1989). The increase in science and technology coverage is mainly due to the rise of coverage focusing on societal problems and conflicts to which science and technology are linked in one way or another: science and technology may be the subject of the problem or conflict, they may be used by one or both sides to support a political stance, or it may be expected that science or technology will find a solution to a problem or resolve the conflict by providing an ultimate answer to the issue.

There are three main ways in which science appears in the media. First, it appears in the coverage of dramatic crises, major discoveries and the feats and foibles of science stars. The applications or implications of scientific knowledge, dramatic or unusual events, and technical disputes have the greatest media appeal. Second, science appears in news articles on drugs, food additive, etc. Finally, it appears as technical information integrated into the news of the day. Strikingly, Henderson (1998) found media are ill adapted for sustained and pro-active coverage. News is attracted to scientific controversy, but not to scientific uncertainty. The abstract, complex and developmental nature of scientific research means that the implications of ‘work in progress’ is seen as ‘too difficult’ (both for journalists and for their perceived audience) and as ‘too abstract’ to be relevant to audiences or provide a ‘human face’. As one journalist reportedly commented (Henderson, 1998: 1):

> Unless [the scientific research] is going to affect that man or woman on the mythical Clampham omnibus we tend not to get involved (…) At the end of the day you come back to what affects the person in the street. People might find the science fascinating but they don’t want to sit

> down and hear that there are a couple of million base pairs of DNA (…) What they want to know is how will it impact on their own daily lives (….)

Kepplinger (1995: 375-6), in researching the German press coverage of nuclear power and biotechnology, found that most of the coverage was published in the political sections of the newspapers and magazines, followed by the science sections. The coverage had a negative slant in the political sections and a positive slant in the science sections. In the political sections the main attention went to persons conducting alternative, and so often more critical research, whereas in the science sections members of academic and commercial research institutions were primarily referred to, thus providing more mainstream and science-friendly reporting than the political sections.

Several social scientists and media scholars underline the importance not only of studying news media but also a much wider range of media content. Henderson (1998: 27-28) sees three reasons for this: first, attention to 'soft' stories is important because they, as much as 'the news', may be crucial in communicating ideas about science and technology to large and diverse audiences. Second, news is, in any case, increasingly framed by soft news values. Third, attention to non-news is essential because analysis of the news media will not 'represent' the media as a whole. Dickinson (1998: 263-265) makes a similar recommendation when talking about food. He claims that most public and official concern about television's influence on food habits seems to be centred on television advertising while there are relative few studies focusing on specific programme genres (cf. Kaufman, 1980; Story and Faulkner, 1990, see Signorielli, 1993). He stresses that content analysis demonstrates that television presents a very wide range of images of food on a daily basis:

> In general, these images, and the ideas and values they embody, are likely to make significant contributions to the social environment in which food choices are made by providing models, reference points, indicators of the acceptable and unacceptable, and, at the simplest level, by offering information which may lead to action over food use. (Dickinson, 1998: 265).

This can also be applied to written mass media. The growth in the size of newspapers with ever more sections and an ever wider range of interests, has led to the appearance of food technology and science issues not only in news and science reporting but in a much wider range of articles. Life Style sections of the press as well as cookery sections can be seen to feature articles on food science and technology. A quick but albeit informative look at some recent newspaper articles on the milk robot show indeed the appearance of the topic in a wide area of articles, thus underlining the importance of a wide scope of research.

2.4 Journalistic practices

The media are not only information providers but also information *seekers*. The ways in which journalists seek information, which events make it into the media and the sources journalists consult are vital parts of the information chain which links complex technological issues with the audience or readership (Campbell, 1999: 4, 10-11).

News values

In the news process relating to new technologies, Gregory and Miller (1998: 108-9) distinguish between two types of journalists covering these issues: journalists and science journalists. However, according to Nelkin (1995: 9), regardless of the type of medium or journalism, journalists are bound by similar cultural biases and professional constraints. Sharing common assumptions about science and technology, their writing on these issues and events takes place within a frame that is, 'a persistent pattern of cognition, interpretation and presentation, of selection, emphasis, and exclusion'. The frame helps journalists to process large amounts of information, to select what is news and to present it in an efficient form.

Usually though, as Gregory & Miller (1998: 109-111) indicate, it is not the science journalist but the news editors who decide what does and does not go into the media. News editors' responsibilities are to the news: they have no particular loyalties to science and technology as an enterprise. This influences the news values that determine what turns technology into news.

In an analysis of news values related to science and technology issues, Gregory & Miller (1998: 109-111) point to certain important criteria (see also Campbell, 1999). The first group of relevant news values are meaningfulness, relevance and consonance. In general, for a news story to be meaningful and relevant, it has to fall within the scope of what people normally think about or can be bothered with. Science and technology though, often deal with areas people do not relate to as a matter of course. Consequently, a lot of these stories are of limited interest to audiences. On the other hand, stories about food and health and psychology are meaningful and relevant, because they are about issues that concern everybody, and of which everybody has some understanding. This is the aspect of consonance. The 'mad cow disease' scare over health risks from infected beef is a good example hereof, as it affects daily (food) habits. But the milk robot too, as a part of the production of an essential consumer good, can be presented as relevant.

Another relevant news value could be unexpectedness, rarity (Gregory & Miller, 1998: 111-112). While the rarity value in science events can work in its favour in terms of unexpectedness, rare events tend not to be familiar and so score poorly on news values such as meaningfulness and consonance. As for negativity: 'most news is bad news' (Gregory & Miller, 1998: 112-113). Bad news is certainly more newsworthy than good news. In this regard, science and technology are ambivalent as they are supposed to be for the common good. If the science and technology news is bad, the science must have

gone wrong somewhere. In this way, negative results (failing milk quality, keeping cows indoors all year round) of the milk robot have, as a rule, a higher chance of making it into the news than when positive developments occur.

Moreover, as Gregory and Miller (1998: 114) conclude: science clearly has some news value. It has facts and is perceived as reliable, and it lends itself on occasion to personalization and co-option. The latter two are also important in relation to television (Gregory & Miller, 1998: 123). As television has no particular interest in science and technology, it has no responsibility to represent these issues in a conventional way. Television tells stories about science, and the stories it tells are in many ways the same as all stories ever told. Stories need characters – heroes and, possibly, even villains; they need plots, denouements, beginnings, middles, and ends.

News gathering

Journalists look for stories in many different places. One such source is the scientific literature (Gregory & Miller, 1998: 108-9). So, newspapers and magazines often publish stories about work that has already been published in peer-reviewed scientific journals (e.g. *Nature*). The advantage is that the story is reliable and has all the details. The disadvantage is that this is 'old' news for the general media. Moreover, journalists take professional pride in finding stories themselves and so they will turn to other sources. So, there is an extended network of press officers and experts to which journalists can turn for news stories.

The relationship between journalists and experts is of a very particular nature and has been the topic of several studies. In general, experts and their employers have a positive attitude towards communicating their research findings to the public (Peters, 1995: 32; cf. DiBella et al., 1991). They see the instrumental value of publicity, for instance for the promotion of a new technology (1995: 33). Journalists and their sources even develop a 'symbiotic' relationship (Cracknell, 1993). However, a study by Dunwoody and Ryan (1985) also revealed scientific barriers. In many cases, media coverage does not conform to norms of scientific publication. Journalists, for example, are blamed for inaccuracy, a lack of objectivity and a non-scientific attitude in their coverage. 'Accuracy' for journalists is a criterion of lesser importance while for expert groups (industry, government, advocate groups, scientists) accuracy is often the most important criterion (cf. Salomone et al., 1990, Ryan, 1979). On the other hand, Nelkin (1995: 8) maintains that journalists themselves often criticize the way science is presented in the press, blaming their sources – scientists and technical institutions – for providing misleading or inadequate information. And she states 'mutually dependent, the communities of science and journalism are wary collaborators in the business of science communication' (Nelkin, 1995: 8). Further differences between experts and journalists include (Kepplinger, 1995: 375-6; Peters, 1995: 44-45, see also Freedman et al., 1986):

- Experts have different opinions on benefits and risks then do science journalists and political editors, the science journalist taking a position between the other two groups;
- Experts and science journalists believe – contrary to political editors – that the shortcomings in science coverage are due to the fact that political editors dominate the coverage of science;
- Journalist assign more weight to a critical function of the mass media than experts;
- Journalists accept an entertainment function of the mass media more readily than experts;
- Experts have a more paternalistic attitude towards the mass media audience than journalists;
- Experts and journalists differ in their preferred style of reporting (experts having less understanding of the journalistic need to attract and fascinate audiences by means of certain stylistic elements);
- Experts expect the media to support their goals while journalists have an indifferent attitude towards the experts' goals;
- If supportive of their goals, experts want media to influence the public more than journalists are prepared to;
- Experts and journalists disagree about their respective roles and the extent of control both sides should exert over the communication process;
- Journalists tolerate (or even expect), more than scientists, that expert sources will violate narrow scientific norms when interacting with mass media.

2.5 The all pervasive and persuasive mass media?

Of course, media discourse is but one of the fora for public discourse. Gamson & Modgliani (1989: 2-3) explain that, rather than a single public discourse, it is useful to think of a set of discourses that interact in complex ways. There is a specialist discourse, in journals and other print media aimed at professionals/experts. There is the oral discourse of officials, and the discourse of pressure groups. General audience media, then, are only some of the fora for public discourse on an issue. This also applies to the discussion on milk robots which, so far, has mainly been held in specialised journals and in industrial contexts and is only slowly being picked up by the general mass media.

It follows that one should be cautious in making inferences about media discourse and public opinion. It is undeniable that mass media are of central importance in the views of the general public on issues like the milk robot. Yet, we do not argue that media discourse can totally and single handedly determine or change public opinion. Rather, the systems are in a process of mutual interaction. Media discourse is part of the process by which individuals construct meaning, and public opinion is part of the process by which journalists and other cultural entrepreneurs develop and crystallize meaning in public discourse. For Hornig (1993: 107), this has implications for both media professionals and for

the scientific community concerned with public opinion. The facilitation of informed democratic dialogue about the wisdom of adopting certain technologies calls for responsiveness to the concerns of the public. And she continues (Hornig, 1993: 107):

> Where the scientific community believes that a technology is potentially of great benefit, that it has been adequately tested and will be adequately monitored in use, and that any risks have been explained to those who will be exposed to them, these are the messages it needs to put forth. Responsible media coverage must address these issues well, taking proactive steps to explore them where necessary and probing for weaknesses along these lines, as well as strengths. No amount of information on probabilities of harm – however phrased – will serve to create a favourable climate of public opinion unless social context issues are also addressed. Where they have not been addressed (either in actuality or in media representations of that actuality), public pressure to address them is likely to continue, and lay evaluations of risk will continue to be responsive to the deficit.

3 Influencing the discourse: Public relations and issue management

So, having established that public opinion is a process in which the mass media play a pivotal, albeit not all-determining role, it is clear that the above mentioned scientific experts are not the only group providing information or, from a different perspective, trying to get access to and a voice in the media. There are many interest groups that battle for their share of column inches and seconds of air time. Kepplinger (1989) for instance, refers to companies and pressure groups. The latter, on the one hand, may have the greatest 'incentive' to get into the mass media as media attention is often the only way for them to survive or at least to reach their potential audience. In the case of the milk robot, there are consumer representatives, health food activists, and animal rights organisations that need to turn to the media in order to reach the general public and attract attention to their activities and claims. On the other hand, companies and industrial groups too will want to promote their activities, i.e. their technological novelties such as the milk robot via Industrial Public Relations (Nelkin, 1995).
Just as academic institutions sell the importance of their science to attract a favourable press, so corporations use the prestige of science and technology to enhance their own goals. Industrial public relations, according to Nelkin (1995: 135 ev) developed at the turn of the 20th century, first as an adjunct to advertising and later as a response to crises that could damage corporate reputations. Damage control remains a major goal for public relations, and experts are engaged to enhance corporate credibility and legitimize company claims. Moreover, in addition to a long tradition of using scientific images in advertising to enhance public confidence in products, firms now also use scientists themselves in their public relations efforts (cf. Epstein, 1973). One example hereof, still according to Nelkin (1995: 136), are advertorials, a kind of advertising placed on the editorial pages of major newspapers and their format resembling news items or editorials more than ads. Some companies employ scientists to influence the coverage of controversial technologies or products. The idea is to 'use the right medium to communicate the right message to the right target audience' (cf. Hainsworth, 1990, Ewing, 1990, Nelson, 1990, Wilson, 1990).

The task of the industrial groups though, exceeds a mere gaining of credibility and popularity (i.e. consumers) for their product or technology. Particularly with industrial activities relating to high-tech food production such as the milk robot, the technology is closely related to (and affected by) public issues of animal rights, production ethics and health. The contemporary predominance of vegetarianism, health food and ethical considerations regarding stock treatment (cf. supra), are all closely linked to the potential acceptance or refusal of the high technological treatment of milking. The industry should be sensitive to this. This is the area of so-called issues management.[3] Issues

[3] Culberton et al (1993: 14) point to many different names that have been given to issues management such as 'advocacy advertising, boundary spanning, corporate planning, crisis management, forcasting, futurism, human resource management, intelligence activities, management styles, public affairs, public policy, and strategic IM '(cf. Grunig, 1988; Hainsworth & Meng, 1988; Heath, 1990, Van der Meiden & Fauconnier, 1994).

management is a way for the industry to pro-actively work on the societal issues that are predominant at a certain point in time and which may affect (or be affected by) the success of its enterprise (i.e. the new technology) (Pratt, 2001: 336; see also Heath, 1997). It has grown from a tradition that favours open and assertive public debate (cf. Schmertz, 1986; Lesly, 1984). The rationale for this view is that if companies get involved before public issues have solidified (become clearly and firmly fixed in the opinion of key publics), they can increase the likelihood that their communication campaigns will succeed, thereby protecting their image and business (Heath and Cousino, 1990: 11; see also Chase, 1984 and Crable & Vibbert, 1985). Constant efforts to inform key publics about industry operations and assistance in establishing the standards that constitute corporate social responsibility are vital. Issues management, then, provides the rationale, tools and incentives to become involved in the public discussion of public (policy) issues as early as possible. Pratt - basing himself on key authors such as Heath, 1990, 1997, Grunig & Grunig, 1997; Renfro, 1997 - sees four steps in issues management:

(a) Anticipate and analyse issues (Pratt, 2001: 337-8). The first rule of issues managment is to understand both the internal and external environment in which an organisation operates and in which its products or services are distributed. Thus, the study of the political, social and cultural context, the identification of key issues and trends, and the evaluation of their potential impact are vital. This is the basis for becoming more responsive to the public interest.

(b) Develop organisational policy issues (Pratt, 2001: 338-9). This calls for formulating goals, objectives, and strategies that guide the formulation of an organisation's position on an issue. There is a double advantage here. On the one hand, public debates can enrich – or besmirch – the actions of an organisation which can, consequently, position itself more clearly. On the other hand, it provides ways and means to strategically influence public opinion and legislative actions regarding these issues. Pratt (2001: 340) stresses how 'unresolved contradictions are deceptive at best and potentially injurious to the public health at worst', and that a see-no-evil, hear-no-evil approach to articulating its position on a public issue is ethically questionable and potentially detrimental to public acceptance of the industry's activities.

(c) Identify key publics whose support is vital to the public policy issue (Pratt, 2001: 340). Issue management is a public policy-driven process. Some of the possible publics include: researchers and associations in the health or food professions, government officials whose legislation and ordinances influence media public agenda's on, and intrepretations of, the issues, and, finally, activist groups. Smith & Furgeson (2001: 297) explain how organisations often resist interacting with activists as they are seen as a threat. Yet, communicating with activist groups can enhance the knowledge about how the corporation and its activities are perceived, and can help to establish trust and credibility (see also Grunig, 1992, Jackson, 1982; Smith, 1997, Oliver, 1991). Grunig & Grunig (1997) therefore stressing the need for a frank exchange of information and mutual respect between the industy and activists.

(d) Identify desired behaviours of key publics (Pratt, 2001: 341). In the end, this should be the ultimate goal of the industry. Yet, the intent here is not merely to change the organisation's publics: it is to make the organisation more responsive to them. Thus, advertising agencies can be employed to help get rid of myths or to disseminate a positive image. Other tactics used to influence public policy and consumer behaviour include selective funding of 'independent' research. Good relationships with the media are obviously of prime concern here.

Eventually Pratt (2001: 343) stresses the importance of a symmetrical context, i.e. responding to the publics' interest in a manner that promotes dialogue and negotiation between organisations and their publics. The application of issues management has strong potential for making a difference to the outcome of the challenges industry confronts. Obviously, issues management has its limits too. A company can try to play into issues sensitive to key publics, but must be careful not to lose its credibility. For instance, issues managers should be sensitive to issue ownership (cf. Budge & Farlie, 1983). Certain organisations can be perceived by the public as 'owning' an issue (eg; environmentalism 'belongs' to the green party) and 'borrowing' an issue (e.g. promoting ones company or product as the most environmentally friendly) can have reverse effects: an industry should not try to be be 'more green than Greenpeace'. Consequently, companies should be sensitive to the extent to which they can borrow issues without losing credibility.

These central aspects of issue management are of considerable relevance in relation to the milk robot. More than simply promoting the robot as a new high-tech advancement in industrial milking, one should be sensitive to the issues that the milk robot may give rise to. Both positive and negative issues regarding consumer rights to quality, ethical treatment of animals and general animal welfare can be triggered into public attention by the widespread introduction of the milk robot and can be important in forming public opinion. Issues management here seems relevant as a pro-active means of dealing with these issues.

4 Conclusion

This international and multidisciplinary study of the relevant literature does not allow us to make predictions about the likelihood of widespread acceptance by the consumer public of the milk robot and its products, nor about public opinion regarding this high-tech tool for dairy farming. Still, some useful lessons can be learned.

The dairy industry as such has an overall positive image, as does its products. At the same time the milk robot can be seen, by and large, to be technically sound, economically profitable and both animal and farmer friendly, despite certain potential downsides such as the quality of the milk and the danger of keeping cows indoors all year round. Still, as the literature implies, there are several important actors and processes mediating between these facts and public acceptance of the milk robot.

First, it is obvious that the interpretation and acceptance of the use of milk robots in dairy farming must be understood within the context of contemporary society. We have seen that while contemporary society is characterised on the whole by hyper-rationalisation and the overall application of ever more advanced science and technology, this has also lead to an undermining of scientific and technological certainties and to the establishment of 'counter movements' such as the environmental, consumer and animal rights groups, which seek to counter-balance the assumed positive consequences of this hyper-rationalisation. This is particularly clear in the area of food production and consumption. Here, the growth of the agro-business has been accompanied by consumers who, struck by gastro-anomie, increasingly revert to non-processed, non-industrially produced food. Potentially, this is an important aspect of opinion formation with regards to industrial milk robot.

Second, it has become apparent that, among the different discourses held regarding topics such as the milk robot (specialist, pressure groups, officials…), the discourse in the general mass media assumes a central role in helping to define general public opinion. In paticular, in the area of scientific and technological developments of which the general public has little direct knowledge, the mass media take up an important function in agenda setting and framing. Public beliefs in this regard tend to correspond to the messages conveyed in the media, even though the direct cause and effect relationship is unclear. In this respect it is important to see how, both in terms of information seeking and reporting, the media seem to display a marked preference for news and coverage centred around dramatic, negative and controversial events. Although we have seen that this is countered by certain other factors, it does remain an important conclusion that, just as in other areas of mass media communications, when it comes to reporting on new technology good news is no news. There is a considerable chance that this will also be of relevance when it comes to reporting on the milk robot.

Third, the importance of a pro-active approach towards information and communication regarding the new technology was advocated. People tend to believe low-credibility sources just as much as high credibility sources. Moreover, it is shown that in areas where the audience has little pre-existing knowledge, the media function as the major sources of information and the major definers of the situation. In this respect, a pro-active approach to providing information about the new technology

seems relevant. This communication with the media should not restrict itself to specific information about technological, economic and other aspects of the technologies at hand. It should also seek to manage issues which can become relevant news items for the media. In respect to the milk robot, certain issues relating to consumer protection (eg. quality of the milk) or animal rights (eg. keeping cows indoors) can be potentially detrimental to the image of the equipment and thus even of the entire sector. Being sensitive to these issues and dealing pro-actively with them, can help to establish a positive view with regard to the milk robot and contribute to its widespread public acceptance.

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