

Innovation: Why we can't, and therefore how we can

A paper prepared for the Sugar Research and Development Corporation.

Whilst considerable investment has been made in research intended to improve producer practices, the extent of practice change commonly falls short. Less research has been conducted in understanding why change is so difficult to implement.

Agriculture has a long history of research into improving production systems. More recently, attention is also being paid to value chains beyond the farm gate. Yet every production system and value chain is first and foremost a social system, comprised of people with individual and collective behaviours. In this neglected arena lies the potential for greatest research gains.

The paper will explain why people tend to be naturally conservative and resistant to change. Based on the simple premise that **we cannot manage what we do not understand**, the intent of the paper is to suggest R&D that will help overcome this unconscious conservatism.

Sources of Behaviour and Individual Difference.

All humans are similar to each other. Most of us have two arms, a head and a heartbeat. Yet our differences are far more interesting. And those differences are important in aiding human survival. Central to this paper are the patterns of similarity and the patterns of difference and the reason for those patterns. These patterns throw light on our ability or otherwise to embrace change. These patterns occur within and between individuals; they occur within and between groups.

Genetics as a determinant of behaviour and individual difference

Human beings are small-tribe animals. For over 100,000 years we have roamed the earth in small bands. The characteristics that we possess today are the characteristics that equip us to be effective hunter-gathers. Though humans settled into more agrarian and urban lifestyles in the last 10,000 years, that period of time is too short for natural selection to have changed any of our characteristics (Nicholson 1998).

The secret of natural selection is to avoid extinction. Any characteristic that does not aid survival is not transferred to offspring. Conversely, only those characteristics that favour survival are retained (Buss, 1995; Miller, 1997). Hence, human beings exhibit only a very small variation in genetic characteristics. The human genome project has revealed 99.8% genetic commonality, even between races. And the function of many of those genetic characteristics is to aid survival.

Yet there are genetic differences between people. Because adverse events might occur, nature deliberately provides humans with some small level of random genetic variation.

That variation will aid or inhibit survival, dependent upon circumstances. One can imagine a context in which being slender might aid survival, yet in a different context might lead to starvation.

Key Learning: There are individual differences between people, differences which aid species survival. Critical characteristic of these strategies is that they are instinctive and unconscious.

Formative years as a determinant of individual difference

The human child is born with its brain only partially developed (Pinker, 1997). During developmental years, our brains adapt us to our particular surroundings. One of the adaptation techniques that has evolved is *niche differentiation*.

(i) Niche Differentiation

All human beings are born into the world with genetic characteristics and potential individual characteristics. How those individual characteristics develop is a function of the interaction between the environment into which the organism is born and the genetic potential characteristics the organism brings - the nature/nurture interaction (Plomin & Daniels, 1987).

A human baby arrives into the world instinctively wishing to survive. It quickly realizes that resources for survival come from parents, and so learns to manipulate the nature of interactions with parents to maximise resource flows. Whatever parental investment is available, the newborn wants 100% of it. One way of maximising resources is to choose an ecological niche, that set of characteristics in the organism that maximises its fit with the external environment while at the same time minimising direct competition with others that share the same environment. For humans, the major competitors for scarce resources are parents and other siblings.

For infants, providers of scarce resources are parents, while siblings are direct competitors only. Therefore, in order to maximise resource flow and minimise competition, offspring differentiate. As a result, full biological siblings are not similar. In fact, considering personality, two children from within the same family are as different from each other as any two children chosen at random (Plomin & Daniels, 1987). Research finds that up to 45% of differences in personality are attributable to the different experiences of each sibling. Up to 90% of those different sibling experiences occur within the family. Further, those differences are enduring, remaining evident throughout adulthood (Sulloway, 1996).

Patterns of differentiation between siblings are not random. In fact, underwritten by some genetic script, patterns of differences within families form patterns of similarity between families.

Eldest children are generally more conscientious and seek parental favour through acting as surrogate parents toward younger siblings. They are more responsible, conservative, and defensive. As adults, this conservatism is a product of wanting to retain or obtain the same or similar environments they experienced as a child. For example, among primary producers, it is commonly the first born who expects to be a farmer, an unconscious psychological expectation reciprocated by parents and resulting in primogeniture, the practice of land ownership passing to the first born. In consequence, first borns are unconsciously highly sceptical of and resistant to change. However, they are also commonly ambitious and materialistic. In an effort to please their parents, they often excel academically, thereby opening up career opportunities that might take them away from the farm.

Middle children have broader interests, lower self-esteem and tend to be more independent, innovative, and risk tolerant. The radicalism of middle children is reflected in them, as youths and adults, finding their ecological niche by moving away from their environment of origin. Unlike older siblings with much to lose and little to gain, middle children have everything to gain and nothing to lose through embracing change. Middle children are less likely to be found in mature multigenerational industries (since they leave), and more likely to be found in fledgling ones (which they start), where established practice either doesn't exist or is there to be tested and varied.

Youngest siblings are commonly less ambitious, less conscientious, and more socially oriented. They are sometimes described as popular, easy going, lazy or spoilt. As adults, they frequently possess excellent interpersonal skills, but are less "driven" than older siblings, often "cruising through life" in a carefree way, expecting, and frequently receiving, support from others, particularly parents. With less ambition than their older siblings, career choices for the youngest are less obvious, sometimes resulting in them choosing to do nothing. In consequence, when their older siblings have left, staying on the farm can be a default option.

The concept of birth order as a shaper of personality is misleading, since it is a proxy for a more important but invisible phenomenon - niche differentiation. We are all born with a set of potential strategies (potential personalities, if you will) for dealing with the world. Our formative years' experience evokes a workable strategy. The important point here is that *each sibling will establish a niche that differentiates it from other siblings*. The niche chosen is sometimes, though not always, predictable by birth order.

Birth order niche differentiation has important implications for willingness to initiate or embrace change. Research into the 23 major shifts in scientific thinking between the 15th and 20th Centuries revealed that those who were the keepers of the prevailing wisdom were overwhelmingly the oldest in their families whilst those who challenged them and created new wisdom were overwhelmingly laterborns. The statistical probability of this finding being a fluke, given the database of 3,800 scientists, is less than a billion to one!! (Sulloway, 1996). It is the role of the oldest to protect the status quo, while it is the role of younger siblings to explore, challenge and invent the new.

Key Learning: As well as genetics, formative year experiences are also a source of individual differences and are also an aid to survival. They have implications for willingness or otherwise to embrace change. Those who gravitate to positions of leadership in the industry might unconsciously also be the most conservative.

R&D Recommendation 1: It is recommended that R&D in the sugar industry adopt a strategy of diversity by deliberately including ‘mavericks’, people with the capacity to think outside the square and the willingness to challenge conventional wisdom.

(ii) Human Motives

Human behaviour is driven by *motives*. They explain *why* we do what we do and are largely unconscious. Three social motives that have been extensively studied are *need for affiliation*, *need for achievement*, and *need for power* (McClelland, 1987).

Plowman (2005) confirmed that motives establish during formative years as one of the strategies of niche differentiation. That research confirmed *need for power* is most common in first-borns. It also suggested that *need for achievement via conformity* is highest in the eldest, *need for achievement via independence* is highest in middle-borns, and *need for affiliation* is highest in the youngest.

Though established in formative years, motives continue through adult life, influencing the choice of occupations and societal roles (Plowman, 2005). Those with a high need for affiliation seek roles where they can experience mateship; those with a high need for achievement seek individually challenging but achievable tasks, seeking feedback on their efforts; those with a high need for power seek roles that involve influencing others whilst attracting status and prestige. Research has demonstrated that social groups under the guidance of a leader with a high need for power show less creative capacity to solve problems. Need for power commonly correlates with conservatism.

Key Learning: Motives developed during formative years are unconscious and are also highly resistant to more recent influences. Creative people and those with an entrepreneurial bent are likely to be driven by achievement via independence. Those at the helm of sugar industry structures are more likely to be motivated by achievement via conformity and need for power, both of which serve to maintain the status quo and inhibit creativity.

R&D Recommendation 2: Since motives have implications for willingness or otherwise to embrace change, it is recommended the sugar industry adopt a strategy of populating R&D projects with people driven by a need for achievement via independence. At the same time, R&D projects should be shielded, for at least the first half of their life, from those driven by a need for achievement via conformity and need for power.

Contemporary influences as a determinant of behaviour and individual difference

The third of the four determinants of behaviour is contemporary society. People quickly pick up social mannerisms when they relocate between countries or cultures. "When in Rome, do as the Romans do." Accents are an obvious example. We acquire them unconsciously in order to fit in. The need for acceptance, for not being too different (in other words the 'need for affiliation') is prewired within us, strongly influencing the second and third determinants of behaviour.

How people behave within a particular social group is known as *culture*. Whilst accents are an obvious example, less obvious are the shared practices and shared belief systems that shape how members of a social group view their world.

Botha, Coutts & Plowman (2004) mapped the cultural norms of the sugar industry in the Herbert. Their 'cultural imprint' revealed strong cultural undercurrents, often not conscious, that pervade the industry. These undercurrents include 'paternalism', where an organization sees its responsibility to act on behalf of others; 'dependency' where elements of the industry look to other elements to solve their problems; 'distrust' where there is a preconceived negative bias; and a 'problem-focus' as opposed to a solution focus.

Key Learning: Cultural norms are invisible yet have the effect of maintaining the status quo. Any change has cultural consequences and will therefore be fiercely resisted by those negatively affected.

R&D Recommendation 3: Since cultural norms and other contemporary influences are unconsciously maintaining the status quo, then change efforts that do not take them into account are destined to fail. One way of doing this is to adopt an R&D strategy of force field analysis, thereby identifying all of those cultural forces that will be negatively influenced by the proposed change and which will therefore resist it. Change is more easily influenced by working on the less apparent restraining forces than on the more apparent driving forces.

Creativity as a determinant of behaviour and individual difference

The fourth determinant of behaviour is creativity or innovation - the ability to imagine, construct or do something hitherto unknown. Although the bounds of our creativity are limited by prewiring, by formative years and by contemporary society (technology, for example) we'll never know what those bounds are until we push them.

Behaviours based on the fourth determinant are very fragile. Witness the extent, in normal discourse, to which suggestions are tentative and easily dissuaded. The conservatism of the human species (anchored to prewiring, formative years, and contemporary society) attests to the extent to which creativity is not a strong behavioural determinant.

Yet it might be argued that all change ultimately fits into this fourth determinant, doing or thinking something hitherto unknown. Therefore all change challenges the status quo. And the conservative forces of the status quo, embedded in genes, in formative years, and in contemporary society, are strong indeed.

Plowman (2005) invited 379 siblings, each from families of three adult siblings, to provide adjectives that described each sibling accurately yet differentiated it from other siblings. The word 'creative' was offered to describe the middle and last offspring. It was not offered to describe the eldest. Sulloway's (1996) research into paradigm shifts in science, mentioned earlier, supports the point.

Key Learning: People are not equally creative. Further, creative sparks are very fragile and are easily snuffed out.

R&D Recommendation 4: Include in R&D projects people who are perceived as 'mavericks', for new ideas are more likely to come from them. Place them in some form of innovation incubator, necessary for those creative ideas to gather some momentum before subjecting them to rational critical analysis.

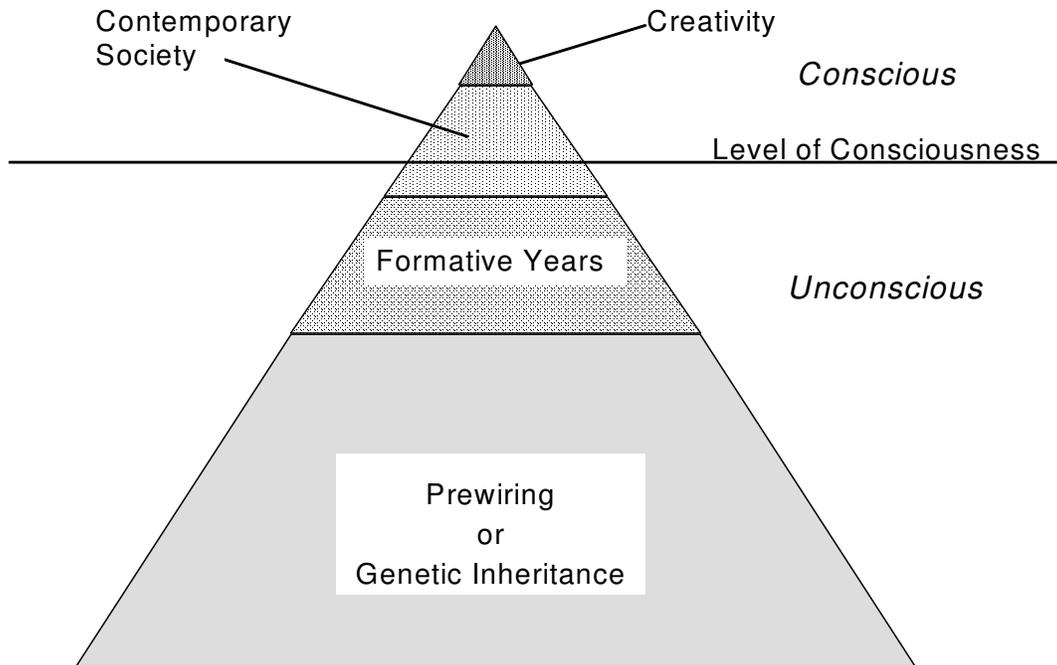
The combined effect of sources of individual difference on capacity to embrace change.

This paper has, so far, explained the sources of individual difference and how those individual differences, as separate components, can embrace or resist change. More important however is the combined effect of these four determinants.

The literature suggests that up to 50% of variability of personality is genetic, and that up to 45% is a product of the environmental influences in our formative years, and the bulk of that occurs within the family (Plomin & Daniels, 1987). Contrary to parental folk law, the influence of parenting practices on individual differences is very small while the perceptual differences of children in relation to siblings is a major contributor to personality (Sulloway, 1996). Note that both of these determinants are largely unconscious. In contrast the influence of contemporary society on personality and behaviour is perhaps 5 to 15% at best. The influence of creativity or new experience is small indeed, perhaps less than 1%. So what makes each of us unique are the four contributors of (i) my genes (up to 50% of my personality, interests and behaviour), (ii) my formative years experience (up to 45% of my personality, interests and behaviour), (iii) societal influences (up to 15%) and (iv) creativity or originality (less than 1%).

All four determinants of behaviour are not independent of each other. Genetics will shape what I can experience in my formative years, as well as how others might influence me. The same applies to the influence of both genetics and formative years upon my contemporary behaviour. Second order effects will impact on all but the first determinant. These unconscious influences on individual and organisational behaviour render impotent much individual and organisational efforts to promote change. Figure 1 illustrates the relationships between the four determinants.

Figure 1: Genetic, developmental, contemporary and creative determinism



The argument being put here is that there are individual differences in capacity to change. Most of these influences are unconscious. Further a change inducing event, new and original for the organism, will only be feasible if consistent with the influences of the other determinants. Table 1 illustrates examples of alignment or otherwise and the likelihood that a change event will convert to new beliefs or behaviours.

To illustrate, learning to use a mobile phone is supported by a natural human predisposition to communicate (genetics), learning to communicate as a child (developmental), seeing other people using mobile phones (contemporary), and discovering for one's self the benefits (new). In contrast, learning to be peaceful in the Middle East is mediated against by the predisposition of young males to run in packs, to be aggressive, and to desire revenge (genetics), childhood experiences of civil mayhem (formative), adult experiences of civil mayhem (contemporary). In this context, the voice of the pacifist is indeed frail. Learning to make peace is very problematic given the other three determinants stacked against it. The reader will readily identify examples in the sugar industry where change has succeeded because of alignment or failed because of misalignment. Practices adopted in one growing region have been strongly resisted in another for this very reason.

Key Learning: The capacity of any individual to embrace change is a function of the alignment or otherwise of the four determinants of behaviour. Further, at a collective level, change will only occur if enough individuals support it.

R&D Recommendation 5: If alignment across determinants influences which creative ideas find favour and which do not, a suggested R&D strategy is to subject new ideas to the ‘four determinants’ test as part of any critical assessment. Further, individual members of any R&D team will be more valuable if their personal four determinants are pro-change, rather than conservative.

Mobility Choice

People have mobility choice; to move towards an industry or a location that they find attractive, to stay in an industry or location that is satisfying, or to move away from an industry or location they find unsatisfying. These acts of mobility are not random. So the questions are: Who moves? Who doesn’t? And why?

Florida (2002) investigated why certain regions and cities in the USA were thriving whilst others were dying. He found that growth areas had net inflows. People who moved tended to include a higher proportion of young professionals who moved to a location that offered them a diversity of lifestyle interests; not to a location that offered them a job. In response, high tech industries followed the migration of these younger professionals, setting up where there was a desired labour pool. Florida’s analysis of the characteristics necessary for a vital thriving learning community is summarized as the three T’s: high on *talent* (education), high on *technology*, and high on *tolerance* for diversity. The cosmopolitan nature of such communities gives them the edge.

In his research into sibling differentiation, Sulloway (1996) found that laterborns tend to leave home first and to travel three times more extensively than their older sibling. The notion of mobility, tolerance, talent and technological sophistication also arose in Rogers’ (1995) research where he found those characteristics more likely higher up the adaptation curve than further down it.

Plowman, Ashkanasy, Gardner & Letts (2003), investigating the characteristics of innovative towns, found the same phenomena. Towns that were growing were not typified by attractive location, by thriving industry or some other unique advantage. Rather, they had net inflows of educated, technologically sophisticated, entrepreneurial people. And what attracted them? Finding kindred spirits who were tolerant of diversity. In contrast those towns that were not thriving showed an intolerance, thereby chasing away the very creative talent they craved.

Similarly, in research examining innovative primary industry associations (Plowman, Ashkanasy, Gardner & Letts, 2004), the two most innovative demonstrated the three T’s found by Florida (2002). This research revealed that the sugar industry often lost its youngest and brightest to other callings. More importantly, the sugar industry has negligible ‘new blood’, people coming in from other industries and thereby able to provide an infusion of new ideas. This is particularly an issue for the decision-making bodies within the industry.

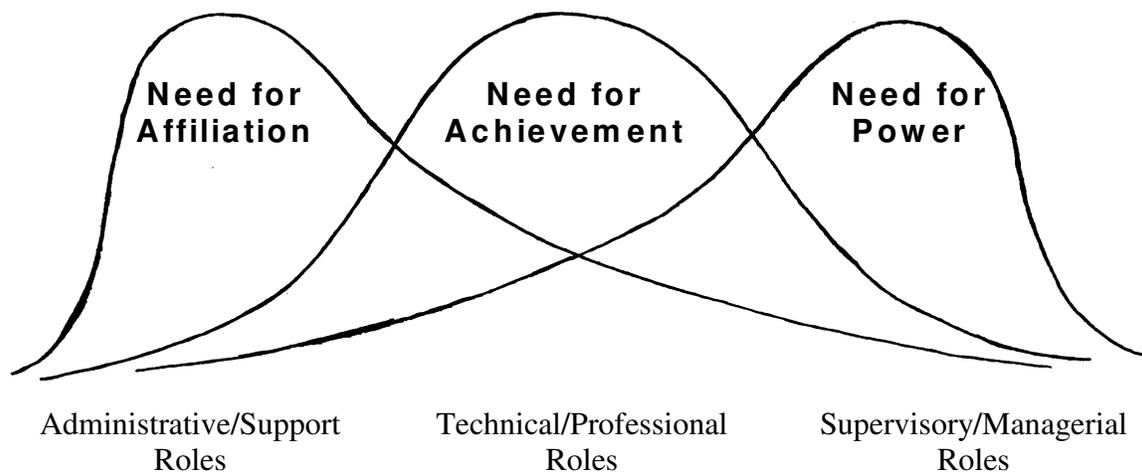
Key Learning: People’s mobility choices are not random. People who are more innovative are also more mobile. Industries with net outflows are increasingly more conservative.

R&D Recommendation 6: The sugar industry should explore mechanisms to broaden the experience and expertise available to it. Whilst travel and learning scholarships offered by SRDC are an excellent start, more effort is needed to open up the industry and its decision processes to those with higher and more diverse levels of professional expertise and experience. In particular, industry decision bodies would benefit from inclusion of people from the arts, from business, from law, from social science, and from tertiary education, to name a few.

Industry structures and their consequences for innovation

Plowman (2005) found that motive preferences underpinned occupational preferences. As a result, any hierarchical organization might comprise three different groups of people, each marching to the beat of a different drum. Figure 2 illustrates:

Figure 2: Probable motive distributions in less innovative organizations



Not only do the three groups differ in their prevailing motive, this difference extends to their language. Table 1 illustrates.

Table 1: The relationship between motive preference and language

Motive	Nature of the language
Affiliation	Subjective, invitational, asking, people oriented “We” (building a relationship)
Achievement	Objective, rational, telling and asking, task oriented. “It” (attention to task)
Power	Subjective (disguised as objective), telling, self-oriented. “I” (drawing attention to self). Note: No genuine information-seeking

Plowman’s (2005) research found that people who occupied senior organizational roles tended to have a distortedly optimistic view of the health of their organization. They tended to be less objective and showed a marked propensity to make statements and inability to ask questions. No questions mean no learning. As a result, senior people, who tend, by virtue of the nature of their role, to rub shoulders more frequently with those who are similar, distance themselves from the field and the critical strategic information available to them.

The structure of the sugar industry is such that its grower organizations and milling organizations tend to meet formally, when the occasion is of strategic importance to each of the parties. This context favours those who thrive on need for power. The resulting adversarial relationships, despite being between two parties who each depend upon the other for their success, consume considerable time, energy and money with limited net gain for the industry overall.

Unfortunately, there is an inverse relationship between need for power on the one hand and creativity and collaboration on the other. Genuine inquiry is unlikely to occur, thereby limiting effective problem-solving and solution-finding.

Key Learning: Hierarchical industry structures tend to form into three clusters of personality types, each operating on an unconsciously different mind-set. The separation of these three distinct clusters renders that structure far less capable than it otherwise might be.

R&D Recommendation 7: It is recommended that those who hold senior positions in industry structures be educated to understand how their unconscious attributes of motives, language and mental models can be detrimental to the industry as a whole. Further, it is recommended that they be trained in adopting alternate and more constructive ways of operating, such as those outlined in the balance of this paper.

Some best practice suggestions from other industries and other countries.

In their research into innovation in primary industry associations, Plowman et al. (2004) compared six different primary industries and their associations. Included in the many recommendations that flowed from that research are three that may have relevance to the sugar industry.

Producers, in Rogers' (1995) terms, range from innovators to laggards. The higher the proportion in the first group, the more progressive the industry is likely to be. When the situation is reversed, the 'tail' tends to drag down the capacity of the industry. Industry associations that wish to become more progressive might consider whether or not, as a condition of membership, producers are willing to adhere to some minimum base standard of quality, farming systems, environmental management systems, and the like.

Second, associations have members, commonly producers. Membership normally accords its members certain rights and privileges. Those rights and privileges need to be balanced with obligations and responsibilities. For example, the most innovative association from Plowman et al.'s (2004) study required, as a condition of membership, that every member should be actively responsible. Though only a small association of 70 enterprises, at any time 40 of those enterprises are on one of its various committees. In this fashion, the burden is shared and managerial knowledge distributed. As a result, this particular association has no paid administrative support. In another industry, an association has a very well established administrative infrastructure which provides excellent member services. However, the down-side is that even the most rudimentary administrative tasks are looked after by 'the girls in the office', rendering many of the producers ignorant of basic managerial functions. Another acknowledged downside is that paid employees have a vested interest in looking after their employment, while the producers remain passive but demandingly dependent.

Third, the innovation literature suggests that one of the characteristics necessary for sustained innovation is freshness of leadership (Damanpour, 1991). The two most innovative associations identified in Plowman et al.'s (2004) research had a constitutional requirement that nobody on the executive could hold their office for more than one elected term. This ensures that leadership is a privilege, not a right. As a result, effective leadership and managerial knowledge is distributed broadly throughout the association, not closely held by a few incumbents.

Key Learning: Innovative industry associations have characteristics that distinguish them from non-innovative ones. Those characteristics are easily adopted.

R&D Recommendation 8 (a): (i) It is strongly recommended that sugar producers adopt, as an R&D strategy, benchmarking of performance relative to each other across a range of variables. Those that fall into the lower quartile might be helped to lift their performance or supported as they exit the industry, thereby removing the necessity of their peers to provide cross-subsidisation. (ii) It is strongly recommended that sugar grower associations consider the extent to which they have a dependency relationship between members and association staff and investigate ways of embedding obligation

and responsibility broadly across their membership. (iii) It is strongly recommended that the sugar industry examine its system of leadership with a view to raising levels of innovation.

In the nation of Argentina, there is no government agency looking after primary production. Yet its primary producers are among that country's social and economic elite. The cause of this good fortune is AACREA, a producer organization formed over 40 years ago and now supporting over 200 producer groups. It operates on the basis of participative action research. The following is a direct extract from their website (<http://www.aacrea.org.ar/>).

The process is based on monthly meetings, held in rotation on the farms of the 10 to 12 enterprises in each group. The main objective of each meeting is to assist the host farmer in solving his problems and planning his management, using the combined expertise of his neighbours.

Key Learning: By acting as members of a Board of Management for each other, neighbours provide the mechanism for continuous improvement through participative action research. This shared responsibility is status free.

R&D Recommendation 8 (b): Rogers' (1995) adaptation literature suggests that most people are more likely to be influenced by their peers. Therefore, it seems evident that a model like the AACREA system will provide R&D in the sugar industry with a new and effective lever for change. It is recommended that participative action research by formally created groups of neighbourhood producers be adopted as an R&D strategy.

Coutts, Roberts, Frost & Coutts (2004) undertook a review of extension in Australia as practiced between 2001 and 2003. One of most innovative projects they came across was Meat and Livestock Australia's *BeefPlan*, a number of self-directed groups operating under what the researchers called the *facilitation/empowerment* model. A group forms in a self-directed fashion in response to an invitation from MLA. Each group, regionally located, is provided with a set of operating guidelines, an MLA-funded workshop within which they are taught methods of self-facilitation, and tools which they use in the same workshop to develop an initial strategic plan. On incorporation, the group is provided with \$10,000 worth of funding which they can use to provide capacity building in any of the four domains of production, business, environmental and social. Whether they be workshops, seminars, field days or study tours, each BeefPlan group chooses activities which address local needs. The one stipulation that MLA places on these activities is that they be open to the broader industry in the region, thereby embracing the adaptation curve philosophy by having BeefPlan members influence those further down the curve.

Key Learning: Effective industry groups are local, self-managing and pursue common interests for mutual benefit.

R&D Recommendation 8 (c): (i) MLA's BeefPlan offers the sugar industry a possible option for leveraging change more broadly. Funded capacity building groups, say one

per grower region, could be established as pilots to test their efficacy in the sugar industry. (ii) The facilitation/empowerment model, whereby grower groups gain the skills necessary to facilitate their own agenda, fits nicely with the appropriately increasing interest into capacity-building.

In Summary:

We cannot manage what we do not understand. The human species is generally conservative, not innovative. As a result, industry structures are also conservative. Resistance to change is normal. It is also unconscious. Individual differences between people and the causes of those differences offer a means of understanding resistance to change and, alternatively, a vehicle for consciously and successfully bringing about appropriate change. Research and development in the sugar industry will meet with greater success if it adopts a strategy of deliberately taking into account the ideas offered in this paper.

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September 06.**

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