

# **Enabling knowledge transfer and exchange within the agri-food supply chain**

**Louise Manning and Andrew Callard**

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Louise Manning, and Andrew Callard, Hartpury College, Hartpury, Gloucestershire GL19 3BE UK

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**Corresponding Author**

Louise Manning  
l.manning@btinternet.com

# Enabling knowledge transfer and exchange within the agri-food supply chain

## Abstract

*Knowledge exchange is considered to be a proven mechanism for enhancing knowledge and skills and increasing human capital within an organisation and/or supply chain. This paper seeks to analyse how the development of knowledge transfer exchange nodes (KTEN) can provide benefits in the agri-food supply chain. An information audit was completed to examine literature in this area of research then qualitative and quantitative primary research was undertaken. Barriers were identified including the cost of knowledge transfer, existing resources in the business, geographic location and access as well as concern over academic culture. Therefore the KTEN model needs to deliver provision by developing networks that underpin sector development, drive innovation and best practice implementation and deliver business opportunity for academic institutions. Furthermore, the structure of these enabling networks and the tools used to facilitate effective communication are key to the success of the KTEN developed within the agri-food supply chain.*

**Originality/Value:** *This research is of academic value and of value to those working in the food supply chain.*

**Category:** *Research Paper*

**Key words:** *knowledge, technology, transfer, partnerships, exchange, agri-food, supply chain*

## 1. Introduction

Knowledge can be defined as “*information combined with experience, context, interpretation and reflection*” (Davenport *et al.*, 1998). Goh (2002) argued that the management of knowledge assets is one of the major challenges an organisation can face especially as such assets often determine competitive advantage. Pemberton and Stonehouse (2000) agreed stating that “*competitive success is governed by an organisation’s ability to develop new knowledge assets that create core competences*” i.e. that organisational learning and the underpinning knowledge resources will generate superior performance. Knowledge transfer has been described as the “*successful communication of useful information within a particular context*” (Theis *et al.*, 2000). The authors suggested that the term “*combines notions of dissemination with the capacity to acquire knowledge. The impetus for knowledge transfer may come from a need to acquire or to disseminate information*”. Cantoni *et al.*, (2001) stated that “*knowledge transfer would indicate conveying or moving knowledge from one person or place to another*”. Gopalakrishnan and Santoro (2004) argued that the terms “*knowledge transfer*” and “*technology transfer*” are often used interchangeably and while they are both highly interactive activities they have varying purposes. They further determined that knowledge transfer “*implies a more inclusive construct*” that is directed more towards the understanding of information, whilst technology transfer is a narrower more targeted construct that utilises tools in order to implement change. They concluded that organisations with more

mechanistic structures and more stable direction-orientated cultures were associated with higher levels of knowledge transfer, whilst organisations with more flexible change-orientated structures were associated with higher levels of technology transfer.

The interrelationship between knowledge and technology transfer lies at the heart of effective, collaborative relationships between knowledge providers, and the recipients, industry and business. Indeed, trust between partners plays a key role (Gopalakrishnan, and Santoro, 2004). Levin and Cross (2004) researched the role of trust in enabling effective knowledge transfer. They determined that because tacit knowledge takes time to explain the process of learning can slow down the transfer between parties, thus it requires greater (stronger) structural and relational ties to be developed and implemented. The party that Levin and Cross (2004) classified as the "knowledge seeker" can become reputationally vulnerable in their relationship with the knowledge provider and this too can impact on the partnership and the degree of trust. A knowledge seeker must identify and communicate current weaknesses in the organisational structure, products or processes, and/or a lack of human capital either personally or within their organisation. Further, they must trust the competence of the knowledge source, or individuals who represent the knowledge source and these strong personal ties create the framework for the knowledge transfer activities to take place.

The mechanisms for knowledge transfer include: knowledge dissemination from one party to another, development of contracts for product and service testing, applied research and market development; and utilising models for knowledge transfer. Knowledge transfer therefore requires a complex interaction that relies on both formal and informal levels of infrastructure, human capital and relevant information. Tsai (2001) stated that "*organisational units are embedded into a network co-ordinated through the process of knowledge transfer and resource sharing*" and proposed the development of a knowledge transfer network that can include both intra-organisational and inter-organisational elements. Knowledge Transfer Networks (KTNs) have already been set up to drive the flow of knowledge within and in and out of specific communities (BERR, 2009).

The UK Government's 'Innovation Nation' white paper (DIUS, 2008) defined how further education (FE) colleges could participate in and expand knowledge and technology transfer (KTT) activities that will support business innovation and develop innovative thinking. The white paper followed on from the recommendations identified in the Sainsbury Science Review 'Race to the Top' (Sainsbury, 2007). The term "Knowledge and Technology Exchange Nodes" (KTENS) can be described as a dedicated technology and knowledge transfer/exchange function with a college. Key drivers of KTENS will be the colleges, the businesses that they engage with, regional development agencies and other fund providers as well as local training providers. A KTEN can improve knowledge transfer (from provider to seeker) and it can also provide knowledge exchange. Knowledge exchange can be in both directions for a range of stakeholders including the businesses themselves whilst also improving the capability and capacity of the participating college or institution. The extent to which the models are based on knowledge transfer or indeed knowledge exchange will underpin the range of services delivered and the resources required by the colleges and the benefit the college itself receives from the interaction.

## 2. Barriers to knowledge transfer

The stakeholders that can either enable or limit knowledge transfer include university administrators, academics, consultants and businesses, organisations and entrepreneurs. The barriers to knowledge transfer between universities and industry have been determined as cultural and information barriers between key stakeholders; staffing and compensation practices; and inadequate rewards for faculty involvement (Siegel *et al.*, 2004). Jacobson *et al.*, (2004) described the barriers as being situated in “*the disjunction between current expectations and the historical authority in academia.*” They concluded that the following organisational policies and practices were critical to promoting researcher’s engagement in knowledge transfer namely promotion and tenure; resources and funding; structures; knowledge transfer orientation; and documentation. Cantoni *et al.*, (2001 citing Hard and Lindkvist, 2000) suggested that there are two main types of barrier to knowledge transfer namely organisational culture and the degree of organisational localisation. They argued that management can promote knowledge transfer by structures, technologies, training, and incentives. The interaction of these elements will vary between intra and inter organisational knowledge transfer. Enabling mechanisms to address these barriers have been defined (Table 1).

**Table 1: Barriers and enablers of knowledge transfer (Adapted from Cantoni *et al.*, 2001)**

Barriers	Enabling processes	Enabling tools
Cultural	Training	Skills/knowledge base analysis
		Gap analysis
		Cost benefit analysis
		Knowledge transfer/exchange mechanisms
	Senior management support	Organisational structure
		Appraisal and review programmes
		Mentoring programmes
	Incentives	Grants/Financial incentives
		Personal incentives
Localisation	Technology	Internet access/On-line support – social networks
	Structure	Communication tools
		Communication networks

Barson *et al.*, (2000) also identified barriers to both knowledge sharing and knowledge management (Table 2). They too highlighted culture as being a key barrier both with regard to inter and intra-organisational knowledge transfer. De Long *et al.*, (1997) further differentiated between knowledge and information stating that “*while information is defined as a flow of messages, knowledge is the combining of information and context in a way that makes it actionable.*” They further asserted that there are distinct differences between knowledge management projects and information management projects (Table 3). The aim of this research was to assess how FE colleges can develop and grow their knowledge and technology exchange activities in the agri-food supply chain and sought to determine the current baseline in this sector. It has been undertaken within the context of existing policy including the Government’s ‘Innovation Nation’ white paper (DIUS, 2007). It set out initial plans for FE to participate and expand Knowledge and Technology Transfer (KTT) activities that would support business innovation and develop innovative thinking.

**Table 2: Barriers to knowledge sharing and knowledge management (Adapted from Barson et al., 2000)**

Technology	Organisation	People
Existing resources e.g. finance, technology, data transfer mechanisms, skills, time		
Available technology – is knowledge sharing and management limited by the technology available?	Rewards – will individuals feel rewarded for their engagement with knowledge transfer?	
Legacy systems – has this been a case in the past and individuals still believe this to be so?	Culture – does the culture support sharing and transfer of knowledge? Are there working methods and procedures in place?	
Efficiency and effectiveness of systems	Poor targeting	Internal resistance – company interests may not be seen as including knowledge sharing
Compatibility of systems	Cost of knowledge transfer	Self interest – knowledge sharing may undermine an individual’s perceived position in the organisation – fear of losing power
	Proprietary knowledge – confidentiality requirements that limit ability to disseminate	Lack of trust and fear of exploitation - fear of becoming redundant,
	Distance – geographical location and access	Risk – fear of penalties – fear of losing confidentiality – fear of losing market position or destabilising company
		Fear of contamination – concerns over how associations between individuals and organisations might be perceived and might influence brand value.
		Lack of common ground e.g. language

**Table 3: Key differences between knowledge and information management projects (De Long et al., 1997)**

Knowledge Management Project	Information Management Project
Goals emphasise value-added for users	Goals emphasise delivery and accessibility of information
Support operational improvement and innovation	Support existing operations
Adds value to content by filtering, synthesising, interpreting and pruning content	Delivers available content with little value added
Usually requires ongoing user contributions and feedback	Emphasis on one-way transfer of information
Balanced focus on technology and culture issues in creating impacts	Heavy technology focus
Variance in inputs to system precludes automating capture process	Assumes information capture can be automated

The New Engineering Foundation (NEF) study ‘Knowledge and Technology Transfer in Further Education’ (NEF, 2008) explored the readiness of the FE sector to engage in KTT activities and recommended a series of actions to help accelerate the development of KTT between the further education (FE) sector and business. One of the key recommendations was to establish hubs of knowledge transfer and business innovation in partnership with regional development agencies (RDAs) and other relevant agencies.

### 3. Methodology

Initially, an information audit was undertaken to examine literature in this area of research. The second stage involved qualitative and quantitative primary research. The knowledge seekers’ attitudes were collected by means of a structured questionnaire. A pilot study was conducted to determine any issues with the layout or wording of the questionnaire.

Changes suggested by the pilot study participants were incorporated into the design of the questionnaire. The agri-food supply chain survey was carried out using the structured questionnaire, which was discussed between the interviewer and the participants either face-to-face or by telephone. For the purpose of this baseline study, questionnaire methodology was considered to be appropriate. The questionnaire consisted of 14 questions. (Questionnaires are available on request from the author). Attitudes were assessed using a yes/no approach. The number of participants (n=30) was deemed appropriate to identify trends and further areas of research. The data obtained from the study was then analysed with the quantitative data being reviewed as well as qualitative comments made by respondents. The potential for a range of barriers to limit knowledge transfer in the agri-food supply chain was determined during the research. The results have been analysed according to the individual questions asked and any limitations are defined at each stage. The research is drawn together in the following discussion.

#### 4. Results and Discussion

The businesses interviewed were at all stages of the agri-food chain and some businesses operated at more than one level. The sectors of the agri-food supply chain are identified in Table 4 and demonstrate that the predominance of the businesses analysed were in primary production. Table 5 demonstrates that seventeen percent of the businesses were operating at two or three levels within the supply chain and of those businesses that determined that they were involved with primary production twenty-five percent were working at two or three levels within the agri-food supply chain.

**Table 4: Sectors of the agri-food supply chain involved with the study**

Sector of the agri-food supply chain	Stage in the supply chain	Percentage of businesses operating in the sector
Farming/Agriculture/Horticulture	Primary	67
Manufacturing/Processing	Secondary	30
Transport and Distribution	Secondary	3
Retail	Tertiary	20
Caterer	Tertiary	3

**Table 5: Complexity of the food businesses involved in the study**

Number of sectors of the agri-food supply chain that the business operates within	Percentage
One	83
Two	7
Three	10

The size of the businesses was analysed in terms of the numbers employed (Table 6) in accordance with the European Commission definitions for micro, small and medium-sized enterprises (EC, 2003). The EC describes the category of micro, small and medium-sized enterprises (SMEs) as being made up of enterprises that “employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million”. A **small** enterprise is defined as “an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million” whereas a **microenterprise**

as “an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million”. Therefore in the context of this study all businesses would be classed as SMEs with ninety-three percent classed as small businesses and sixty percent classed as microenterprises.

**Table 6: Type of business involved in the study according to numbers employed**

Number of employees	Percentage of businesses in each category
Under 5	50
Between 5 and 9	10
Between 10 and 49	33
Between 50 and 249	7
250 and over	0

Participants were asked to define “knowledge transfer” and eighty-three percent of those asked did not recognise the term. Eighty one percent of the businesses involved solely in primary production also did not recognise the term. All participants were familiar with the term “training”. The type of knowledge transfer activity accessed was also analysed. This varied between short courses, typically one day skills or knowledge transfer, national vocational qualifications (NVQs) or their equivalent from Level 1 to Level 5. The results are collated in Table 7. The results demonstrate that for the organisations involved in the study whilst eighty seven percent of the businesses had accessed short courses this fell to between three and seventeen percent that had accessed NVQ or equivalent programmes.

**Table 7: Level of training undertaken by businesses involved in the study**

Level of “training course” accessed by businesses	Percentage of businesses in each category
No training	0
Short courses (1-6 days)	87
NVQ Level 1/ BTEC Certificate	3
NVQ Level 2/ GCSE/ BTEC first diploma	17
NVQ Level 3/ A levels/ BTEC OND	10
NVQ Level 4/ HNC/HND/ degree	10
NVQ Level 5/ Masters degree	3

The knowledge transfer activities that had been accessed to date were also evaluated to consider by the type of knowledge provider (Table 8). Seventy percent of participants have used private training providers and Business Link training, with half having accessed training at an FE establishment. The results demonstrate that the thirteen percent of organisations were involved with knowledge transfer through research and seventeen percent through continuous professional development (CPD). The percentage of businesses using consultancy for knowledge transfer may be underrepresented as some agricultural businesses described “agronomists” as consultants whereas others did not. The research does demonstrate that on-line training had a relatively low uptake compared to other forms of knowledge transfer and the uptake of knowledge transfer through the “train to gain” programme was low at seven percent. The diversity of sources of knowledge provision was also analysed as the organisations used between one and seven different sources of provision (Table 9).

**Table 8: Type of knowledge provider accessed by businesses involved in the study**



<b>Skill and knowledge provider</b>	<b>Percentage of businesses in each category</b>
Local Training Providers incl. Business Link (private)	70
FE Establishment	50
HE Establishment	13
On-line training	10
Train to Gain	7
Continuous Professional Development	17
Research	13
Consultancy	30

**Table 9: Diversity of knowledge provision accessed by businesses involved in the study**

<b>Diversity (number) of sources of knowledge provision accessed</b>	<b>Percentage of businesses in each category</b>
One	40
Two	20
Three	14
Four	3
Five	7
Six	3
Seven	3

The results demonstrate that sixty percent of the organisations only use one or two sources of knowledge provision. The organisations were asked if they would consider developing a collaborative project with an FE college or a University, otherwise termed Higher Education (HE), establishment to assist their business with product development, innovation or competitiveness and only thirty three percent said that they would do so. This fell to twenty seven percent for those businesses involved solely in primary production.

**Table 10: Potential barriers to accessing knowledge provision defined by businesses involved in the study**

<b>Potential barriers to businesses becoming involved in knowledge transfer</b>	<b>Percentage of businesses that stated this factor would be a potential barrier</b>
Cost of knowledge transfer	88
Existing resources	65
Academic culture	56
Geographic location/ access	38
Confidentiality concerns	33
Lack of trust of outside organisations	29
Business culture - lacking procedures	28
Fear of sharing information	17

The businesses that reported that they would consider a project did not differentiate between using an FE or an HE establishment. Twenty seven percent said they would use either with three percent stating they would only use an HE establishment. The respondents were also asked to identify if any of the factors defined in Table 10 would be a barrier to knowledge transfer. The ranking shows that cost of knowledge transfer, the existing resources in the business, as well as concern over academic culture were key factors. The cost of knowledge transfer was seen as a barrier by a greater proportion of micro-businesses as was academic culture and geographic location/access. Geographic location and access

was more of a barrier with primary producers in that at certain times of year they could not access training because of lambing, calving or harvest, planting or other business demands (Table 11).

**Table 11: Potential barriers to accessing knowledge provision defined by micro-businesses and small businesses involved in the study**

Potential barriers to businesses becoming involved in knowledge transfer	Percentage of micro-businesses that stated this factor would be a potential barrier	Percentage of small businesses that stated this factor would be a potential barrier
Cost of knowledge transfer	92	87
Existing resources	64	67
Academic culture	62	52
Geographic location/ access	42	36
Confidentiality concerns	33	27
Business culture - lacking procedures	29	26
Lack of trust of outside organisations	25	23
Fear of sharing information	17	14

The NEF Report "Knowledge and Technology Transfer in Further Education" (NEF, 2008) stated that the following factors persuaded businesses to use FE colleges: availability of relevant expertise (forty nine percent), close proximity (thirty four percent), existing contacts in college (thirteen percent) and others (four percent). With regard to academic culture the NEF report stated that: "*Language continues to be a barrier to engagement and as a consequence, there is a need for mutual understanding of the needs of the FE sector and business*". This research would support this statement in that qualitative data suggested that primary producers were concerned about the suitability of knowledge transfer in terms of practical application and the level of delivery. This is further underpinned by the fact that only seventeen percent of respondents could actually define knowledge transfer whilst they all recognised the term "training".

## 5. Conclusions

The research sought initially to determine the current baseline in this sector and awareness of knowledge transfer and knowledge transfer partnerships. Whilst the literature differentiated between the terms knowledge transfer and knowledge exchange, the results of the study would indicate that "knowledge transfer" as a term, has not been effectively disseminated within the agri-food supply chain, especially at the primary production level. Manning *et al.*, (2006) determined that effective communication required the provision of clear information as well as communicating the complexities and uncertainties associated with the information provided. The development of a KTEN within the agri-food supply chain requires a co-ordinated approach that develops enabling frameworks as well as communicating effectively to the sector. This research would suggest that further research work should be undertaken to determine the suitability of varying models of enabling frameworks as well as the most effective methods of communication.

A number of barriers that impacted on knowledge transfer were identified and some of them are driven by the limitations of organisational size. The ranking showed that cost of knowledge transfer, the existing resources in the business, as well as concern over academic culture were key factors. In rural areas and for agricultural based businesses, geographic location and access was also considered a barrier to knowledge exchange. Therefore the KTEN

model needs to recognise this and deliver provision that meets business needs especially where these fall into seasonal rather than academic timetables. The capacity and capability within the college also needs to be assessed to determine that the appropriate skill set is in place to deliver knowledge exchange.

The research highlighted that the respondents were all SMEs with ninety-three percent classed as small businesses and sixty percent classed as microenterprises. This makes it crucial to provide networking facilities to drive innovation, best practice and improved competitiveness. In order for the small and micro-enterprises within the agri-food sector to drive this forward knowledge exchange has to continually take place. The knowledge seekers need to be able to access appropriate, relevant and affordable knowledge and technology exchange services. Academic institutions can provide a variety of these services for organisations and within the knowledge exchange model can in turn benefit both financially and in terms of developing their own human capital. Furthermore, the structure of enabling networks and the tools used to facilitate effective communication are key to the success of the knowledge transfer exchange nodes within the agri-food supply chain.

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