Literature Review

2.1 Overview
The chapter contours and elucidates on the objectives of the research presented in the introduction chapter. To identify various components for the conceptual model the chapter presents the backdrop, context and importance of the existing literature with the intention to develop a strategic e-commerce model for Udupi jasmine.

The chapter begins with understanding the significance of Udupi jasmine from other varieties of jasmine and the importance of the GI tag attached to it. This is followed with a review of literature to find out the role of ICT in the agricultural sector. Detailed assessment is done to understand the role of ICT in improving the socio-economic status of the farming community. Udupi jasmine is a localized crop specific to a geographical location and understanding the importance of local factors is critical. Hence the importance of localization of ICT, in general, is analysed. Comprehensive evaluation is done for the various agricultural e-commerce initiatives in India. While assessing some of the existing e-commerce models the chapter presents the benefits of using e-commerce and ICT in marketing Udupi jasmine. Exploring various literature on ICT and e-commerce in agriculture the researcher attempts to highlight the absence of literature with respect to the marketing of Udupi jasmine. The exploratory study of the literature will provide a basis for the development of an e-commerce model to market Udupi jasmine, which will be explained in the chapters 3 and 4. As there are different techniques available for the validation of any given model with reference to technology and consumers, Technology acceptance model (TAM) is used for the validation of the proposed e-commerce model. Detailed assessment is done to comprehend the use of TAM in e-commerce-based applications. Thus, providing a complete environment from the perspective of the development of the model to the validation of the proposed model.
With the existence of an immense amount of literature available on e-commerce and ICT in agriculture in general, the researcher shuns from the claim that the chapter contains a detailed review, but merely attempts to provide important notions related to the study. While making an earnest attempt to highlight the lack of literature related to the marketing of Udupi jasmine the focus of the chapter is to explain the lucidity of the study that helped in the development and validation of the proposed model. For the determination of variables that can be included for the study, an extensive number of research articles, textbooks, thesis and websites are scrutinized in the areas of Information and Communication Technologies, e-business, e-commerce, agriculture, TAM, etc. The study is divided into different sections which include the following sequential review of the literature:

Section 2.2 evaluates the niceties of Udupi jasmine and the importance of Geographical Indication (GI) tag. It also reviews the concept of Udupi jasmine community-based enterprise and the importance of it.

Section 2.3 explores the role of ICT in agricultural sector. It assesses the role of ICT in improving the socio-economic status of the farming community and evaluating the importance of localization of ICT projects.

Section 2.4 examines the various agricultural e-commerce applications and new insights into existing e-commerce models. It also delves into the benefits of e-commerce and ICT in marketing Udupi jasmine.

Section 2.5 analyses the applications of Technology Acceptance Model and how it can be used for the validation of the model proposed for marketing Udupi jasmine.

Section 2.6 concludes with the summary.
2.2 Udupi Jasmine GI crop

Jasmine is one of the oldest flowers grown for its aromatic scent. India is one of the centres of origin of jasmine. It is widely used in southern India for various decorative purposes and for personal use. Jasmine is also used in the production of perfumes and cosmetics. The genus Jasminum is reported to comprise of 500 species. A critical analysis of these species, however, has revealed the number of true species to be only 89, of which 40 inhabit the Indian sub-continent (Lakshmi & Ganga, 2017). Udupi Jasmine is one of these species belongs to Jasminum Sambac – 1 species of jasmine (T. H. Ashok and Chayanika Sarma., 2016).

In 2013 Udupi jasmine was registered under the Geographical Indication (GI) tag\(^1\). Geographical indications are important identifiers developed as a Trade-Related Intellectual Property Rights (TRIPS) by World Trade Organization (WTO). It is used to identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin. World Intellectual Property Organization (WIPO, 2004) describes that GI tag is awarded as a community intellectual property for a product based on their scientific importance equivalent to a geographical location. As many GI products are from the agriculture sector, it helps in creating an export market with the GI mark. With the GI mark, a regional product will have an edge as it will get a boost in the exports and more visibility internationally. It gives a competitive edge to farmers of a particular region over individuals who sell counterfeit products (Banerjee, M. and Nausahd, 2010). Geographical Indication Registry, of India, as of 2019 has identified and sanctioned GI status to 615 products\(^2\).

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There are 48 GI products in Karnataka and Udupi Jasmine is a good example of an intellectual property owned by the community. Udupi jasmine is predominantly valued for its mild scent. From being used in traditional events to weddings and funerals. It is used for personal ornamentation such as in garlands and in women's hair. Many of the devotees use it as an offering in temples and to decorate holy statues (Cnaan, Bhat, Meijs, & Handy, 2004).

Udupi jasmine flower growing community of coastal Karnataka have maintained a community-based enterprise for more than 85 years. Many of the farmers of this region depend directly on the cultivation of Udupi jasmine for their livelihood (Krishnamurthy MK, Parameshwar NS, Sridhar Herle P, 1995). With an efficient system of pricing and distribution, trust and cooperation among the community and an accepted method of matching demand and supply just by thumb rule, the community has kept poverty away for nearly three generations.

2.2.1 Udupi jasmine Community-Based Enterprise (CBE)

There has been an emergence of community-based solutions for the conservation of environment and generation of income among poorer sections in Asia (Hazare, 1997; Lyons, 2002). Community-Based Enterprise (CBE) is a community which is in the pursuit of mutual benefits while acting corporately as both entrepreneur and enterprise (Peredo & Chrisman, 2004). Also, CBE is “managed and governed to pursue the economic and social goals of a community in a manner that is meant to yield sustainable individual and group benefits over the short and long term” (Peredo & Chrisman, 2004). Some of the aspects that exist in indigenous communities of developing countries are not essentially captured by the traditional concepts of economic development and entrepreneurship (Peredo & Chrisman, 2004). To overcome the widespread poverty in rural areas, CBE bids a new method for the reduction of poverty by relying on local
capacity, culture, knowledge, ingenuity, and resources. The jasmine growing enterprise in coastal Karnataka is a perfect example of sustainable community-based enterprise (Cnaan et al., 2004). Udupi jasmine cultivation is very particular to southern parts of Udupi especially in Shankarapura and surrounding villages, including Shirva, Belle (Moodubelle and Padubelle), Belman, Kaup, Katapadi, Bantakal, and Innanje.

2.3 ICT in agriculture

ICT is infusing in all service sectors and business development models (Kramer, Jenkins, & Katz, 2007) it’s becoming critical for the survival of businesses to keep up with the demands of this digitally-driven market. Access to information has increased considerably due to the usage of mobile phones. In developing countries, mobile phones have been accessed by most of the individuals and are often more used than other information technologies such as radios, newspapers, and landlines (R. T. Jensen, 2010). ICT is an umbrella term which includes applications using computers and other communication tools as mobile phones, social media, online and offline digital information repositories, digital audio-video materials (Balaji, Meera, & Dixit, 2007). ICT in agriculture have the potential to facilitate greater access to information that drive or support knowledge sharing. For the efficient dissemination of information, ICT can play an important role. In this digital era, ICT can play a major role in delivering authentic and fast information in a way the end-user can use it hassle-free (USAID, 2010). Information access is critical for developing countries and the evolution of ICT provides new technology and new opportunities. The process of sharing information through agricultural extensions have long been hindered by issues associated with relevance, scale, responsiveness, and sustainability (Aker, 2011). Although its application is evolving in the agriculture sector, ICT has demonstrated its ability to reach the farmer community (Ali & Kumar, 2011).
Accurate and complete information is vital for performance. Usually, information encourages the competence, efficiency of production and customer service at the firm level (Thompson & Sonka, 1997). Consumers are important for the growth of a firm and relevant information may help in the trust factor of a product and hence increase the demand.

Access to agricultural information that leads to support in knowledge sharing can be potentially increased with the usage of ICT by the agricultural community. ICT’s essentially facilitates the creation, management, storage, retrieval, and dissemination of any relevant data, knowledge, and information that may have been already been processed and adapted (Batchelor, 2002; Chapman & Slaymaker, 2002; Heeks, 2002; Rao, 2007). In spite of agricultural technologies, research and development efforts in India, the inefficiency in the distribution of relevant information is the biggest hindrance in Indian agriculture (Bahl, 2008.). Information that is timely available, accurate and reliable is essential for the wellbeing of the farming community and to increase agricultural productivity. ICT is quite essential in the development of agribusiness.

Understanding the importance of information dissemination in the development of agriculture and business has stimulated numerous actors to use ICT on different mechanisms. Some of the agricultural ICT initiatives in India are described in Table 2.1.

Table 2.1: Agricultural ICT initiatives in India.

<p>| WARANA        | The Warana “Wired Village” project provides information in local preferred languages which is important as it can reach the rural population. It provides information education opportunities, crops, weather, prices etc. Village kiosks are set up and information is provided through them. They are the link between |</p>
<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
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<tbody>
<tr>
<td>SeedNet</td>
<td>The SeedNet portal gives access to seed related information. Research institutes, certifying agencies and seed testing organizations can get seed related information such as testing procedures, new crop information, etc through the portal. (Bihar Department of Agriculture, 2011)</td>
</tr>
<tr>
<td>iKisan</td>
<td>iKisan provides information and solutions to farmers in management of crops, fertilizers, weather forecast, pesticides and other information (“Ikisan Agri-Informatics &amp; Services,” 1999)</td>
</tr>
<tr>
<td>Agriculture Information System Network (AGRISNET)</td>
<td>It is one of the components of the Government of India's central scheme titled “Strengthening/promoting agricultural informatics &amp; communications”. It provides network infrastructure at ground level enabling agricultural activities to improve rural development. (“Agriculture Resources Information System Network,” 2004.)</td>
</tr>
<tr>
<td>Haryali Kisan Bazar (HBK)</td>
<td>HKB provides information and solutions for financial services, farm-output, and regular expert advice. It maintains farmer database and provides information on crops, latest technologies, weather forecast, etc. (“Haryali Kisaan Bazaar: DCM SHRIRAM,” 2004.)</td>
</tr>
<tr>
<td>e-Arik</td>
<td>The project is used to understand the numerous applications of ICT in delivering information inputs and measuring its socio-economic impact among rural tribal farming community in the</td>
</tr>
</tbody>
</table>
"Yagrung" and nearby villages of East Siang district of Arunachal Pradesh State.  
(“e-Arik,” 2007.)

| eSagu | eSagu provides doorstep personalized expert advice in a timely manner. From the start of agriculture produce till the product reaches the market useful expert advice is provided in terms of digital information. Individual farmers can get expert advice based on their problems and it is delivered on the same day.  
(“eSagu agro-advisory system,” 2004.) |

| Agricultural Marketing Information Network (AGMARKNET) | This online information network provides everyday market price and information of the arrival of numerous agricultural products in many different regional languages.  
(“Agricultural Marketing Information Network,” 2000.) |

| Mobile Based Fertilizer Management System-mFMS | Mobile Based Fertilizer is used to monitor the supply of fertilizers from manufacturers to retailers. It also helps stock management by keeping track of stock at warehouses, wholesalers, and retailers.  
(“Integrated Fertilizer Management System,” 2016.) |

| Gyandoot | This project helps in extending the benefits of IT to rural areas that do not have access to such technologies. It provides a link between rural and government by providing information through booths located in rural areas. It is implemented in Dhar district of the state of Madhya Pradesh, India.  
(“Purveyor of Knowledge, Gyandoot,” 2000.) |
<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
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<tbody>
<tr>
<td>e-Choupal</td>
<td>It’s an initiative started by ITC that provides farmers with various agricultural inputs through kiosks located in individual villages. They also provide information on best agricultural practices and support for agricultural produces. (“ITC e-Choupal - Rural India’s largest Internet-based intervention,” 2000.)</td>
</tr>
<tr>
<td>Kisan Call Centre (KCC)</td>
<td>The Kisan Call Centre uses telecom to provide various information on agricultural practices in local languages. It provides a toll-free number that can be accessed. (“A Portal of Government of India for Farmer Centric Mobile Based,” 2004.)</td>
</tr>
<tr>
<td>Digital green</td>
<td>This initiative uses visual aid to convey the information to the agricultural community. They use videos to convey information. The agricultural information of local relevance is disseminated through digital video. The system maintains a database of videos that are prepared with the help of experts and farmers. These videos are then shown to groups or communities through various digital means. (“Agricultural information disseminated through digital video,” 2006.)</td>
</tr>
<tr>
<td>Indian Farmers Fertiliser Cooperative Limited (IFFCO)</td>
<td>IFFCO Kisan uses phones to deliver relevant information through different local voice messages. Individual programs are also given to farmers as per demand. The farming community is also given expert talk on specific subjects through phone-in programs. (“Empowering the Indian Farmers,” n.d.)</td>
</tr>
</tbody>
</table>
Mahindra Kisan Mitra

This is an information related portal that gives various agricultural related information on price, weather advisories, etc. Banking related information such as loans and insurance schemes are also provided to the farming community. Farmers are also motivated through various success stories that are portrayed on the website.

(“Mahindra Kisan Mitra,” n.d.)

Reuters Market Light

Reuters Market Light provides phone-based information to farmers through SMS. These SMS can be customized by the farmer to their preference and information on crops, best practices, markets, etc are conveyed to them via SMS.

(“Rml Agtech,” n.d.)

2.3.1 Role of ICT in improving the socio-economic status of the farming community.

The role of ICT in socio-economic development of an individual, society and nation is considered central to rural and nation development (Gupta, 2006). Bhatnagar & Schware (2000) shows the successful use of ICT in rural development. Starting with the beginnings of ICT in rural India and its growth over a period sheds light on how ICT can be used to overcome problems faced in the implementation of rural development programs. There are several instances in India where ICT has been used to improve the socio-economic status of the farming community. The application of ICT in Madhya Pradesh, Uttar Pradesh and Tamil Nadu among farmers have helped them in reducing transaction cost that involved information acquisition and facilitating transactions in input and output markets (Adhiguru & Devi, 2012). Similarly, in Uttar Pradesh use of
ICT by livestock farmers has helped them to make better decisions than non-ICT users (Ali, 2011). During different study periods, Datt & Ravallion (1998) determined both relative and absolute poverty had been reduced as a result of the increased level of farm productivity due to ICT. There has been significant poverty reduction due to the enhancement of agricultural productivity (Roy & Pal, 2001). While using micro-level survey data R. Jensen (2007) shows a great reduction in price dispersion, waste, and increase in the welfare of consumers and producers with the adoption of mobile phones by fishermen and wholesalers in South India. The paper provides a clear indication of the increase in buyers by improving information that affects the functioning of the rural market in a competitiveness way. A significant improvement in average yields and reduction in the market price fluctuations was observed due to the information provided by the internet booths set up the public sector in India. (Goyal, 2010).

As the evidence suggests with the improvement of competence in the arbitrage of prices and the decrease in the consolidation of market power within the value chain segment relates directly to the main effects due to the use of ICT in rural agricultural markets. The result of this is the better supply of the producer to the growing markets. This, in turn, can result in greater supply from producer groups to growing markets, reduction in the inconsistency of price and decrease of dependence on transportation for market transactions (R. T. Jensen, 2010). It is well documented from the above literature that ICT has proven beneficial in uplifting the socio-economic status of Indian farmers. A large community of framers depends on the cultivation of Udupi jasmine. Through their perseverance and dedication, these community-based farmers have faced the test of time but have largely failed to reap the benefits of ICT. As ICT has proven to be beneficial to community-based farmers largely, application of ICT in Udupi jasmine community-based enterprise is highly recommended.
2.3.2 Importance of Localization.

Agricultural scenario at present is changing rapidly and has become multifaceted thus timely, relevant and reliable information access to the farmers is critical. Farmers need to access information that is vivid, from different sources and specific to context and related to crop production. They not only need access to information in crop production technologies and best practices but also varied information on after harvest aspects such as marketing, handling, processing and storage (Ban, 1998). As different geographical locations have specific needs in terms of crop timings and other specificities, providing generalized content to farmers in different regions might not help.

Thus, rather than providing generic information, providing context-specific information would have a greater impact in terms of adoption of technologies and could potentially increase the farm output of fringe and small agricultural landholders (Samaddar, 2006). Glendenning & Ficarelli (2012) defined local content as that is culturally, economically, politically and socially relevant to a given society or as a content that is planned for a definitive local audience, as defined by a geographical location, language or culture. Despite the swift spread of ICT and farmers latent ability to access information, several agricultural initiatives face common trials such availability of localized content in native language, ease of use, issues of sustenance, ease of access, affordability, ease of scaling and relevance (Keniston, 2002; Rafiq Dossani, D.C. Misra, 2005; Saravanan, 2010).

A project's success would largely depend on the approach, evaluation, application, and delivery of content of ICT projects which would increase the likelihood of the use of ICT by farmers. Content relevancy is the key component of ICT projects that would address the information needs of farmers. The relevance of content is influenced by the extent to which the content is customized (Glendenning & Ficarelli, 2012). Thus, it is important that content is localized. while producing content involving users directly or
a question and answer approach can improve such localization. The sources of the content are generally local experts and organizations that have expert knowledge. This can then support the content of localization (Glendenning & Ficarelli, 2012).

There is a disconnection between the agricultural project and the end-users as a number of times the ICT project is not relevant to the local context and needs (Ballantyne, 2002). Without the necessary knowledge of the working of the existing system and the necessities of farming community, often content is pushed to people by projects. It is necessary for information generation to be a two-way process in agriculture, with the focus being at the farm level which will help in generating contextually appropriate content (Chapman & Slaymaker, 2002). With a two-way process, farmers can generally share their experiences and best agricultural practices which can be incorporated into the program as a farmer knowledge base (Silva, 2008).

Ali & Kumar (2011) found substantial differences in the process of decision-making among farmers based on their social groupings, size of the farm and levels of income in India. Those farmers whose income and farm size were larger and were not from the lower castes had better decision making and information use capacity for their farms. Content can then be contextualized by the ICT project based on the community’s information needs. Multiple interactions with the community will ensure the trust of the establishment, a better understanding of the demands of local communities, hence providing insights to the needs of the community that the ICT platform will serve. Clear understanding of the demands of the communities require competency in analysis of the needs. This involve the process based on actual dialogues with the members of the community, which then requires the empowerment and organization of the community. Thus, this complication of empowerment and organization of the community will often
hinder the ICT projects from serving the deprived groups within the community. (Chapman & Slaymaker, 2002).

The relevancy of the information needs and access to locally contextualized quality content for the poor is more in spite of the time and cost associated with the local content generation (Cecchini & Scott, 2003). Content that has quality, reliable and easily available is relevant for the decision-making of the farmers and could reduce the costs involved in learning and information seeking (Llewellyn, 2007). While developing content and delivery mechanisms, farmers characteristic has to be kept in mind, such as the size of the landholding, socio-demographic profile or agro-climatic zone of the user groups (Rivera, 1996).

The important questions that needed to be asked are: when and what information different types of farmers need? (Garforth, Angell, Archer, & Green, 2003; Narula & Nainwal, 2010). The answers to the questions can be determined through surveys, Participatory Rural Appraisals (PRA), and focus group discussions, as well as by involving users in the monitoring and evaluation of programs (Cecchini & Scott, 2003; Colle & Roman, 2002; Meera, S. N., A. Jhamtani, 2004). The type of information provided by an ICT project will also depend on each project’s motives. Hence determining the community’s needs along with the critical understanding of the existing system proves to be a major success factor for an ICT project.

2.4 E-commerce in Agriculture.

The advent of e-commerce has provided numerous prospects and challenges for commerce around the world. E-commerce can be defined as the process of buying, selling, transferring, or exchanging products, services, and/or information via computer networks, including the internet (Turban, Lee, King, McKay, & Marshall, 2008).
Fruhling & Digman (2000) describe e-commerce as using the internet to market products and services, buying and selling of goods and services, information exchange, creating and maintaining relationships over the internet, which is one of the aspects of e-agriculture.

For its inclusiveness, simplicity and its bearing to e-commerce in the agricultural field, this definition seems more appropriate for this study. While there are a substantial number of benefits, it is widely believed that e-commerce has the potential to increase the profits in agricultural markets by increasing sales and decreasing search and transaction costs. E-commerce markets tend to attract more customers as they are likely to be more transparent and competitive than physical markets, hence increase in demand (Montealegre, Thompson, & Eales, 2007).

Agricultural e-commerce is any method of using electronic communications and computer technology to conduct agricultural business so that trading partners can share a wide range of data. E-commerce in agriculture have revolutionized the way agricultural produces are sold and has changed the way of interaction between agribusiness and consumers through communication channels (Folorunso, Sharma, Longe, & Lasaki, 2006). Agricultural e-commerce is to introduce e-strategy to improve the interaction and trading activities between participants in the agricultural sector and changing the configuration and relationships at various stages in linkages of the food supply chain.

There has been much evidences that e-commerce offers an important opportunity for cost reduction and demand enhancement (Leroux, Wortman, & Mathias, 2001). Ferentinos, Kostas, & Nick (2006) have determined three categories of e-commerce being implemented in agriculture:
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- **e-marketplaces**: A place where buyers meet sellers with an expectation while expecting to manage and adjust to each other’s expectations.

- **e-distribution sites**: A place that will match or replace the standard distribution channels.

- **e-procurement sites**: A place that provides a collection of online information to customers that will provide them with price transparency.

E-commerce has entered into all sectors and development of agricultural e-commerce is the need of the hour. Dong (2016) stresses the importance of the development of agricultural e-commerce as the system is needed for agricultural economic development, acceleration of agricultural information flow, expand agricultural market sector and promotion of agricultural industrialization process.

Many agribusinesses have capitalized on the advantages of e-business to improve the marketing and trading of their products. E-commerce theories in agriculture have different approaches, based on the business processes and transactions of the participating types of entities, it is generally classified into three different categories. The major categories are Business-to-Business (B2B), Business-to-Customer (B2C), and Customer-to-Customer (C2C). Business-to-Business involves online transactions between businesses (Thanasankit, 2003), it implies similarities or equal partners in trade. Common business-to-business (B2B) agribusiness transactions such as buying, selling, trading, delivering, and contracting seem to be natural targets for conversion to e-commerce (Shapiro & Varian, 1999). By contrast “Business to Consumer” (B2C) suggests a difference between the two parties. It includes retail transactions of products or services from businesses to individual customers and is also called e-tailing (Turban et al., 2008). In “Customer-to-Customer” (C2C) e-commerce, business originates from consumer and the ultimate destination is also consumer. This type of commerce is best
suited for dealing in goods for which there is no established market mechanism (Syarifudin, Abbas, & Heriyati, 2018).

In agriculture, the B2B and B2C categories which use internet for transactions can be also referred to as Agribusiness-to-Agribusiness (A2A) and Agribusiness-to-Grower (A2G) (Jamaluddin, 2013). Small stakeholders often find it difficult to take advantage of market opportunities in developing countries due to the widespread irregularities of markets such as discontinuity of information on modern technologies and price, disconnection with the established market actors and constrains in credit process (Markelova, Meinzen-Dick, Hellin, & Dohrn, 2009).

Leroux et al. (2001) identifies several theoretical benefits of e-commerce in agriculture such as:

- Advancement in the flow of information, transparency in market and price discovery
- Simplification of coordination with industry
- Decrease or exclusion of costs involved in transactions.

To increase the economic development of rural society e-commerce plays a vital role. To implement agricultural e-commerce insight, and consciousness are the most important things. The successful implementation of agriculture e-commerce depends on the farmer's awareness and the support for infrastructure (Kalpana & Shibu, 2017). E-commerce solution assessment, selection and execution will involve a detailed understanding of the type of industry, marketplace and organization (Leroux et al., 2001). Agricultural Marketing is the process of identifying, communicating, and maintaining relationships with buyers of a producer’s products to directly affect volume, value and timing of sales (USAID, 2013). Application of e-commerce in agriculture
boosts the chances of the commodity to be visible to a larger market. Udupi jasmine is restricted to the coastal regions of Karnataka. Hence use of e-commerce to market Udupi jasmine will expose it to a larger population. Literature review suggests that there is no e-commerce model to market Udupi jasmine. Hence it paves a way for the development of an e-commerce model for Udupi jasmine.

2.4.1 Discerning some of the existing e-commerce models

The development of an e-commerce model for agriculture needs an understanding of the existing e-commerce models. During the development and implementation of e-commerce projects, J. Wang, Zhu, and Zhang (2016) brings forward some issues and problems:

- Decimation of information in agriculture at lower levels
- Limited knowledge of the rural population in using e-commerce
- Lack of knowledge to increase e-Commerce benefit
- E-commerce environment that is unfinished
- Characteristics of various agricultural products
- Access to the internet is limited
- Lack of farmers skill in using technology.

While developing and implementing agriculture e-commerce Jia (2017) puts forward the following suggestions:

- Essential information resources integration
- Area development focus of e-commerce
- Logistics and distribution system solidification
- Plan to increase farmer’s and customer’s agricultural profit

W
There are several top agriculture technology start-ups in India operating at different levels. These are platforms that link farmers to consumer B2C or retail B2B markets such as agriculture supplies market for procurement of seeds, fertilizers, etc. The classification of these are shown in the table below.

Connecting farmers with suppliers:

These companies provide online platforms for connecting farmers with those who supply farm inputs products like seeds, machinery, agrochemicals, etc. through methods as buying, renting, leasing, sharing, etc.

Table 2.2: Platform connecting farmers with suppliers.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>Agrostar</td>
<td>It provides agronomy consultation and takes orders for farm inputs such as seeds, fertilizers, farm implements, etc. over a phone call. (“Agrostar</td>
</tr>
<tr>
<td>FarmGuru</td>
<td>It holds campaigns for farm inputs typically required for a particular crop. Farmers pledge for the campaign, thereby forming a community. (“FarmGuru</td>
</tr>
<tr>
<td>Trringo</td>
<td>Developed by Tractor manufacturing company Mahindra, Trringo provides tractors and other farm machinery on rent. (“Trringo</td>
</tr>
<tr>
<td>DestaMart</td>
<td>DestaMart is an e-commerce platform, that provides pesticides, agricultural supplies, fertilizers and seeds to the rural market. (“DestaMart Home,” 2010.)</td>
</tr>
</tbody>
</table>
BigHaat | Agriculture Products Online,” 2015.)

Multi-state cooperative society

Indian Farmers Fertilizer Cooperative Limited (IFFCO) FFCO's provides farmers with consistent, high superiority agricultural inputs and services. In an environmentally supportable method, it provides high-quality fertilizers in satisfactory quantities to increase crop productivity. It also undertakes activities to improve farmer welfare.

(“IFFCO,” 1967.)

Connecting farmers with buyers:

These companies build platforms that connect farmers with buyers/consumers like wholesalers, traders, and retailers who work along the product value chain and help farmers sell their produce.

Table 2.3: Platform connecting farmers with buyers.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>Private</td>
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</tr>
<tr>
<td>Lawrencedale Agro Processing</td>
<td>The company procures produce from farmers, sorts, grades, packages and supplies to retail stores.</td>
</tr>
<tr>
<td>(LEAF)</td>
<td>(“LEAF</td>
</tr>
<tr>
<td>Siddhivinayak Agri Processing</td>
<td>Specialised in potatoes, the company sells seeds and other inputs and offers consultation to around 6,000 farmers across seven states.</td>
</tr>
<tr>
<td></td>
<td>(“Siddhivinayak Agri Processing Pvt. Ltd. – End to End Solutions in Potato Supply Chain,” 2008.)</td>
</tr>
</tbody>
</table>
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| Crofarm | Crofarm Provides retail stores with direct access to fruit and vegetable farmers.  
(“Crofarm | Boost Business,” 2016.) |
| --- | --- |
| “I Say Organic” (ISO) | Delhi based organic food retailer works with over 1000 farmers across 12 states to foresees making organic produces readily and easily available. The consumers have options of cash or online payment and they can select products through their mobile phones or through the website. Products are delivered to the doorstep.  
(“Buy Fresh & Certified Organic Food Online @ I Say Organic,” 2012.) |
| Government | National Agriculture Market (eNAM) is a trading portal whose presence is across many places in India. While creating a combined national market for agricultural commodities, this portal connects the existing APMC mandis (marketplace). Through a clear auction process, it provides better prices based on the value of harvest along with timely online payment.  
(“eNAM online trading platform for agricultural commodities,” 2016.) |

**Precision Agriculture:**

Companies leveraging technologies such as wireless sensors, IoT, predictive analytics, machine learning, machine vision, image processing and multi-spectral analysis. These technologies are used for planning and operations in open field farming, livestock, and aquaculture.
Table 2.4: Platform that provides precision Agriculture.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>Private</td>
<td></td>
</tr>
<tr>
<td>Airwood</td>
<td>Using unmanned aerial vehicles (UAVs), Airwood captures farm imagery, while a team scours the farm for soil sampling and testing. (“Airwood</td>
</tr>
<tr>
<td>Eruvaka</td>
<td>It provides integrated hardware and software platform for remote data capture, monitoring, analytics, and automation for commercial aquaculture. (“Home</td>
</tr>
</tbody>
</table>

Wen (2007) while presenting a knowledge-based intelligent e-commerce system provides practicable solutions based on the outcomes of rule-based reasoning. The system is used for selling agricultural products and gives assistance in forecasting sales and financial analysis. W. Wang (2010) put forward that big enterprises may launch their own agricultural e-commerce but for small and medium agricultural enterprises use third-party e-commerce “Customer-to-Government-to-Business” (C2G2B), so that government can provide attention and take up a leading role.

While comparing two B2B models of agricultural e-commerce, namely E-market Intermediation Model (EMIM) and Integrative Content Centre Model (ICCM), as displayed in Figure 2.1 and 2.2, Zhang & Xiaofang (2004) describe that EMIM is usually applied in the early period of agricultural e-commerce, since the field of agriculture is short of skilled people who are good at information technology. With the development of agriculture e-commerce, ICCM will be widely applied later, because it
is helpful for the agricultural industry, considering the fact that many kinds of agricultural products are disseminated, and it is very difficult for both farmers and agribusiness to get the agricultural products trade together. Therefore, it is an effective way to make an alliance between agriculture and enterprise. As a result, EMIM and ICCM will be the main application model of agricultural e-commerce in the short term.

Figure 2.1: E-Market Intermediation Model framework. (Source: Zhang & Xiaofang, 2004)

Figure 2.2: Integrative Content Centre Model framework. (Source: Zhang & Xiaofang, 2004)
In providing a comparative study of agriculture e-commerce business model between India and China, Dong (2016) argues that Indian agricultural e-commerce focuses on solving the poverty of farmers and primary emphasis is given to reduce the farmer's cost involved in production and purchase. Whereas China’s agricultural e-commerce focusses on improving the income of farmers. Thus, focus on improving the farmer's income should be a priority in agricultural e-commerce framework as it affects the socio-economic status of a farmer. While comparing the path of agricultural e-commerce between India and china Dong (2016), finds a number of differences in the important factors such as commodity circulation, information flow, capital flow, logistics, personnel flow and credit flow that affect the agricultural e-commerce.

In terms of listing four e-commerce system functionalities: auctions, storefronts, enterprise portals, and e-procurement Turban, King, Lee, Warkentin, & Viehland (2002) provide some direction for a functional model of e-commerce. While comparing four architectures of e-commerce systems Treese & Stewart (2003) provides an explanation of functional characteristics and reviews on each of the four systems. The four architectures compared are:

1. Open Buying on the Internet (OBI) architecture: The OBI group proposed this standard architecture for B2B e-commerce. It comprises functions for the purchasing organization to pick a supplier, surf the supplier's catalogue and then an option to place an order. Other functionalities include options for confirming an order by the purchasing organization, authorization of an external payment authority for electronic payment and fulfilment of an order.

2. Merchant Server Architecture (MSA): This architecture provides functionalities for presentation of product, options to use information on products from an electronic catalogue and entry of an order.
3. Open Market Commerce Architecture (OMCA): Open Market developed this architecture that has options such as presentation of a product, usage of product information from an electronic catalogue, electronic payment, fulfilment of an order, order entry and providing customer service.

4. Secure Electronic Transaction (SET): This architecture focuses on electronic payment function. SET architecture adds an electronic payment functionality to the merchant server model.

2.5 Technology Acceptance Model.

Internet technology today has been adopted by many people in their personal and, in their professional life. To know people’s intention to use e-commerce web application to buy jasmine online, one can use certain theoretical models. For the adoption of technology, there are a couple of suggested models. The most popular models are the Theory of Reasoned Action (TRA) (I. Ajzen & Fishbein, 1980), Theory of Planned Behaviour (TPB) (Icek Ajzen, 1985), Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989), Social Cognitive Theory (SCT) (Wood & Bandura, 1989), Innovation Diffusion Theory (IDT) (Moore & Benbasat, 1996) and most recently the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Thong, Chan, Hu, & Brown, 2011). Davis, (1989) based on the Theory of Rational Attitude (TRA), proposed TAM (Figure 2.3). The model taking a simple measure from a brief period of interaction with a system attempts to predict future user behaviour.

TAM is considered an influential extension of the theory of reasoned action (TRA), according to (I. Ajzen & Fishbein, 1980). While adapting TRA, TAM was used to describe why a user accepts or rejects ICT. TAM provides underlying support to understand how external variables affect intention to use, attitude, and belief. TAM model variables Perceived Usefulness (PU), and Perceived Ease of Use (PEOU) are
proposed as key drivers predict application usage (Lederer, Maupin, Sena, & Zhuang, 2000). PU is defined as “the degree to which a person believes that using a particular system would enhance his or her job performance”. PEOU is defined as “the degree to which a person believes that using a particular system would be free from effort” (Davis, 1989). TAM variables relations are shown in (Figure 2.3).

Figure 2.3: The Technology Acceptance Model, version 1. (Source: Davis et al., 1989)

TAM external variables are other factors that may exert some influence on a person’s attitude towards a system. Venkatesh and Davis (1996) (Figure 2.4) found that PU and PEOU both had a direct influence on behaviour intention, which then lead to the elimination of the attitude construct.

Figure 2.4: Final version of Technology Acceptance Model. (Source: Venkatesh & Davis, 1996)
Later, Venkatesh & Davis (2000) made an extension of Technology Acceptance Model. TAM 2, as the model referred to, is built on the original TAM model but with further theoretical concepts incorporated. The concepts were cognitive instrumental processes which incorporates result demonstrability, job relevance, perceived ease of use and output quality and social influence processes incorporates voluntariness, subjective norm and cognitive (Figure 2.5). When testing their theories (Venkatesh & Davis, 2000) reached an understanding that, as in previous research, perceived usefulness was a significant factor of intention to use the technology. A strong secondary factor was “perceived ease of use”. Both “perceived ease of use” and demonstrability were seen to have a substantial impact on intention across all studies made. TAM 2 also stated that the direct results of subjective norm underlying intention are most significant prior to the development and later decrease as user experience grows. Furthermore, it has been revealed that subjective norm has a noteworthy impact on intention to use in mandatory settings, but not as extensive in voluntary settings.

Figure 2. 5: Technology Acceptance Model 2. (Source: Venkatesh & Davis, 2000).
The direct compliance effects of subjective norm are presumed to operate when a person feels that a social actor wishes this individual to behave in a certain manner and that this behaviour can be rewarded if complied but also punished if not. A voluntary setting is instead defined as “the extent to which potential adopters perceive the adoption decision to be non-mandatory” (Venkatesh & Davis, 2000). Job relevance, output quality and result demonstrability are further subcategories that do not become affected as experience increases. Thus, they remain equally important as prior to the development (Venkatesh & Davis, 2000).

TAM 3 (Figure 2.6) was later developed by a combination of TAM 2 and a model conducted by Venkatesh & Bala (2008) regarding different possible anchors behind perceived ease of use.

Figure 2.6: Technology Acceptance Model 3. (Source: (Venkatesh & Bala, 2008)
As early as year 2000, Venkatesh claimed that individuals’ perception of perceived ease of use, within the Technology Acceptance Model, forms from the individuals’ general beliefs concerning computers and the use of computers. These anchors underlying the individuals’ general opinions are computer self-efficacy, computer anxiety, computer playfulness and perceptions of external control or facilitating conditions. Venkatesh also theorized two system characteristics to be of importance in determining “perceived ease of use” at the point in time when individuals have gained experience of the technology. These are defined as perceived enjoyment and objective usability (Venkatesh & Bala, 2008). Findings enlightened regarding perceived usefulness in TAM 3 were consistent with the previous model, TAM 2. Subjective norm, image, result demonstrability, job relevance and output quality were all significant predictors behind perceived usefulness. Similar subjective norm diminished as experience increased while image continued to play an important role (Venkatesh & Bala, 2008).

The theories put forward indicates the factors that will influence the intentions of using technology. The constructs of the model may vary based on the objectives of the research. While analysing people’s intention to shop online, Technology Acceptance Model is widely used (Ha & Stoel, 2009; Hassan & Al-Alnsari, 2010). Chuttur (2009) says that while modelling approach in IT research, TAM has captured the most attention of the scientific community. Gefen and Straub (2000) remarks that while predicting information technology adoption TAM is most widely researched models, while (Cheung, Zhu, Kwong, Chan, & Limayem, 2003) confirmed that TAM as one of the dominant theories in the area of e-commerce adoption by consumers. Agarwal & Prasad (1997) asserts that TAM has been widely accepted among information systems researchers, due to its sumptuous and a great deal of empirical support for it in recent years.
2.5.1 Applications of Technology Acceptance Model in e-commerce.

A lot of TAM research has been done in the aspect of IT acceptance of work-related activity and the theory can also be successfully applied to various non-organizational settings (Argawal, Karahanna, & Agarwal, 2009; Mathieson, 1991; Szajna, 1994), which also includes e-commerce (Gefen & Straub, 2000; Lederer et al., 2000; Lee, Park, & Ahn, 2001). The practicality, effectiveness and feasibility of TAM has been shown in a number of empirical studies (Han & Jin, 2009). Gefen & Straub (2000) while taking amazon.com as an example analyses a user’s behaviour towards the intention to using e-commerce website based on the TAM. While taking MBA students in a commercial college as respondents to carry out the empirical study. They ascertain that PEOU does not affect behaviour intention in a purchasing task but affects behaviour intention in an inquiry task and purchasing something on the website PEOU will affect PU and in turn, PU will affect behavioural intention.

While explaining the consumer's acceptance of shopping online Lin & Lu (2000) asserts that the researcher can use TAM to explain this behaviour. They demonstrate PEOU exerts an indirect influence on behaviour intention through PU and does not have a direct effect on behaviour intention. While studying online shoppers O’Cass & Fenech (2003) validates the application of TAM on retail e-commerce. They determine that PU and PEOU has positive correlation with the attitude of online shopping. It has been proved effective to use TAM to study consumer’s attitude towards behaviour intention of using e-commerce and is used widely. Babin & Babin (2001) shows that consumers who feel adept at using online sales or e-commerce systems will have a desire or intention to purchase.

A number of review of literature shows that TAM studies have been applied in e-commerce sites that are selling books (Gefen & Straub, 2000), transactional web sites
(Aladwani, 2002), technological fields (Schepers & Wetzels, 2007), electronic supermarkets (Henderson & Divett, 2003), electronic payment systems (Plouffe, Vandenbosch, & Hulland, 2001), groupware (Lou, Luo, & Strong, 2000) and also across countries (Rose & Straub, 1998) etc. From the various related research shown above, while predicting the personal acceptance of use technology TAM has mostly been widely accepted, used and deployed. From the aspect of e-commerce website, TAM constructs usefulness and convenience of use affects the consumer decision to conduct a transaction and are a major factor that affects the use of the website (Syarifudin et al., 2018).

2.6 Summary

A methodical literature review is considered an important step in constructing a research field. The chapter begins highlighting the importance of Udupi jasmine cultivation to the community-based enterprise of coastal Karnataka. It sheds light on the significance of GI tag and how it helps a community of growers to improvise their livelihood. The review elucidates various instances of ICT in improving the socio-economic status of a farming community. The review highlights the importance of localization of projects to succeed and reach the right actors. While discerning some of the existing e-commerce models the review explains the use of e-commerce in marketing of agricultural products to a wider market. Finally, the chapter considers the role of TAM to understand whether an ICT project will be accepted by the consumers.