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# **An Investigation of the Environmental Turbulence Factors and their Sources in the Collaboration - Postharvest Food Loss Relationship**

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## **Abstract**

Recent studies suggested that collaboration among upstream agricultural supply chain (ASC) partners will impact and possibly reduce postharvest food loss (PHFL) levels; a possible direct relationship between collaboration and PHFL was indicated. There have been many changes in the ASC's environment related to globalization, changing consumer attitudes and concerns, changing markets, increased competition, new technologies, commodity price fluctuations, food safety and quality standards and regulations, Common Agricultural Policy (CAP) reform in EU. The aforementioned changes cause turbulence in ASC's environment and possibly impact both collaboration level among upstream partners and PHFL levels. The Greek ASC environment is characterized as being highly turbulent due to the changes in EU's ASC environment. Contingency theory (CT) is utilized to conceptualize the different environmental turbulence factors in the Greek ASC. This research aims to identify the relevant environmental turbulence factors in the Greek ASC that might moderate the collaboration-PHFL relationship in the Greek ASC.

**Keywords:** agricultural supply chain, environmental turbulence, postharvest food losses, supply chain collaboration, producers

## **1. Introduction**

Interventions to reduce PHFL are seen as important efforts to reduce world's food insecurity and to realise agriculture's potential to meet the world's need for food (The World Bank 2011). Reducing PHFL can increase food availability and food security without wasting any other available resources (Rolle 2006). Recent studies suggested that collaboration among upstream agricultural supply chain (ASC) partners will impact and possibly reduce postharvest food loss (PHFL) levels; a possible direct relationship between collaboration and PHFL was indicated. There have been many changes in the ASC's environment related to globalisation, changing consumer attitudes and concerns, changing markets, increased competition, new technologies, demand for environmental sustainability and food safety and quality regulations. The aforementioned changes cause turbulence in ASC's environment and possibly impact both collaboration levels among upstream partners and PHFL levels. The Greek ASC environment is characterised as being highly turbulent due to the changes in EU's ASC environment (Kaditi & Nitsi 2010).

The aim of this paper is to investigate and thus confirm the existence of different environmental turbulence factors under the specific context (i.e. Greek ASC) that possibly moderate the collaboration-PHFL relationship. A literature review of the relevant studies is conducted to fulfil the aim of this study following aspects: a) describe the main changes that created a turbulent environment in EU ASC environment, and b) analyse the relationship between environmental turbulence and the collaboration - PHFL relationship. The different environmental turbulence factors are investigated by conducting sixteen semi-structured interviews with Greek producers. This paper offers valuable insights not only to producers, but also to all the different actors in the upstream supply chain by identifying the different environmental turbulence factors that might influence their relationships with partners, their PHFL levels and their performance as a whole.

## **2. Changes in the EU ASCs Environment & Environmental Turbulence**

Turbulent environments are environments characterised by the following characteristics: high levels of inter-period change that creates uncertainty and unpredictability, heterogeneity, dynamism and hostility, high level of competitive intensity and uncertainty (e.g. Calantone, Garcia & Dröge 2003). Increasing environmental turbulence requires firms to continuously adapt to changes in their business environments and questions the ability of traditional supply chain management models to manage it (Christopher & Holweg 2011). In the EU ASCs environment there are high levels of inter-period change and the future environmental conditions cannot be accurately predicted due to the high levels of uncertainty (Galanopoulos, Karantininis, Mattas & Karelakis 2011). The main changes in the EU ASCs environment are the following: EU policies (CAP reform and CMO), changing consumer attitudes and concerns, technological innovations, power imbalance in the chain, socio-economic factors, climate change (i.e. sustainable development and limited natural resources), trade liberation and globalisation (e.g. Bourlakis & Weightman 2004; Foresight 2011; Reynolds, Fischer & Hartmann 2009; Van der Vorst, Beulens, de Wit & Van Beek 2009; Spence & Bourlakis 2009; Matopoulos, Vlachopoulou, Manthou & Manos 2007). Thus, the EU ASC environment can be characterised as a highly turbulent environment.

The aforementioned changes in the EU's ASCs environment also impacted the Greek ASC's environment (Kaditi & Nitsi 2010). Over the last few years there was a continuous decline in the performance of the Greek fresh produce supply chain (SC) (Paseges 2012). It seems that the actors of the Greek ASC and in particular the producers have not reacted and adjusted to the need for structural change as other EU SC actors did (Kaditi & Nitsi 2010). The Greek fresh produce producers seem to be confused and do not fully understand what and how they need to change and react in order to survive in this continuously changing environment; this created a highly turbulent environment.

## **3. Environmental Turbulence and the Collaboration - PHFL relationship**

Food loss refers to a decrease in edible food mass throughout the part of the supply chain that specifically leads to edible food for human consumption (FAO 2011). Recently a number of researchers (e.g. Mena, Adenso-Diaz & Yurt 2011; Tupper & Whitehead 2011) have examined either the consumers' side or the retailers' side with an effort to reduce food losses in the SC, considering the different points in the chain where these losses occur. However, there is a lack of research concerning the producers' side where the majority of the food losses is said to occur (at this point the SC food loss is termed as PHFL). Postharvest food loss (PHFL) is defined as a decrease of edible food mass that occurs from producers and after harvesting until reaching retailers.

Different ways have been suggested to address the food losses problem and in particular PHFL such as improving technology, developing better storage and cooling facilities etc (e.g. Hodges, Buzby & Bennett 2010). We argue that even when all the technological or infrastructural improvements are implemented there will not be sufficient and sustainable reduction in PHFL and that collaboration is the basis to all the different actions that have been proposed to resolve this problem. Collaboration can be defined as two or more business partners working together to create competitive advantage and achieve more benefits than firms working individually (e.g. Cao, Vonderembse, Zhang & Ragu-Nathan 2010).

Contingency theory (CT) suggests that there is no best way to organise and solutions are situational depending on the different environmental conditions (Wright & Ashill 1996). CT suggests that the fit between an organisation and its external environment influences the performance of the firm (Calantone, Garcia & Dröge 2003). CT aims to identify organisational designs or structures (i.e. the patterns of interactions among individuals) that promote organisational adaptation to environmental, technological and information processing contingencies (Zeithalm, Varadarajan & Zeithalm 1988). Many studies investigated the impact of environmental turbulence on SC partners'

relationships (e.g. Sambasivan, Siew-Phaik, Abidin Mohamed & Choy Leong 2012; Trkman & McCormack 2009; Fynes de Búrca & Marshall 2004). Saccani & Perona (2007) examined contingency effects on buyer-supplier partnerships in the manufacturing context. However, partners' relationships in ASC are impacted by the specific industry's environmental characteristics. PHFL levels are also influenced by exogenous and endogenous environmental factors; it was found that PHFL levels are sometimes caused due to legislation, food safety and food quality standards factors (Kader 2010; Paull, Nishijima, Reyes & Cavaletto 1997). Environmental turbulence has been described as an important contingency factor of organisations external environment (Glazer & Weiss 1993). Environmental turbulence in the SC can be classified in terms of its origin, as endogenous and exogenous turbulence (Trkman & McCormack 2009). Endogenous turbulence can be measured by studying the different environments in which a firm operates in terms of competitors, market, technological and regulatory turbulence (Cadogan & Paul 1999). Exogenous turbulence involves discrete events (e.g. workers strikes, contagious diseases) and continuous uncertainties (e.g. inflation rates, price changes; Trkman & McCormack 2009). In this paper we identify only the endogenous environmental turbulence factors, as they are the ones that could be possibly controlled by SC entities.

Most of the previous research examined turbulence at SC level, at firm level or suppliers level (e.g. Trkman & McCormack 2009), however this paper investigates the environmental turbulence from producers. Upstream ASC members face completely different environmental uncertainties compared to other industries SCs. In this paper based on the CT, we aim to identify the relevant environmental turbulence factors of the Greek ASC from the producers' perspective that may have a possible impact in the collaboration-PHFL relationship.

#### **4. Research Methodology**

The research approach is qualitative and it consists of sixteen semi-structured interviews. The semi-structured interviews have been conducted with Greek producers from the fruit and vegetable sector (in this case 'peach'). The overall aim of conducting the semi-structured interviews was to investigate the existence of the different environmental turbulence factors and their sources under the specific context and unit of analysis (i.e. producers). The respondents were asked four questions about each of the different environmental turbulence factors. The interviewed producers were asked the following questions:

- Are there many changes in the food regulations in your industry?
- Is there competition among producers in your industry?
- Are there many changes in the composition of your customers (i.e. buyers) and their preferences?
- Do you know what the changes in consumers' preferences and demand for your products are?

The results from the interviews were analysed based on the aforementioned questions about the different environmental turbulence factors.

#### **5. Interview Results**

##### **5.1 Regulatory Turbulence**

There were many changes in food regulations in the last few years. However, the sources of regulatory turbulence have not been yet examined from the producers' perspective. From the interview data analysis it was clear that not all the Greek producers have adopted and implemented all the different food regulations suggested by Common Agricultural Policy (CAP). Through the interviews we found out that some producers perceived that there are no specific guidelines on what food regulations they need to adopt and comply with. The minority of the interviewed producers, who export, said that there are many changes in food regulations and they have adopted integrated management of the produce to control every single point in the growing, harvesting, handling and transportation process.

Another factor of regulatory turbulence which was identified by Despoudi, Papaioannou & Dani (2013) is the continuous change of food safety, quality, labelling, packaging and traceability regulations and standards. The majority of the interviewed producers said that there were many changes in food regulations in the past three years. The producers said that usually they are informed about any changes in food regulations either from an independent agriculturist or from the cooperative's agriculturist that they sell their produce to. Although there were many

changes in food regulations, the main issue for Greek producers was that they were not informed about those changes. Their awareness regarding the changes in food regulations seemed to depend on the buyer that they sell their produce to. Thus, the regulatory turbulence factor was found to be an important turbulence factor in the Greek ASC.

### 5.2 Competitive Turbulence among producers

The interviewed Greek producers found to have limited knowledge about competition from other EU countries. They said that there is no competition with other producers in general (i.e. both in Greece and EU). Competition among Greek producers is 'healthy' competition and makes them perform better (i.e. have better production). Thus, the competitive turbulence factor in the Greek ASC is seen from the aspect of 'healthy' competition among producers. This type of competition has to do with the competition among producers regarding their skills and knowledge about farming methods. Hence, the competitive turbulence factor is a turbulence factor that is present in the Greek ASC.

### 5.3 Market turbulence

Market turbulence is the rate of change over time and within an industry is the composition of customers and their preferences (Kohli & Jaworski 1990). Customers might be both product buyers and consumers. Greek producers' customers vary considerably year by year. The interviews revealed that producers who sell their produce to a cooperative know more about who their final customer is, while producers who collaborated with wholesalers they were not sure what happened to their produce after they sold it to them. In cases where producers sold their produce directly to consumers, there was high uncertainty regarding the composition of the customers. This was because producers were not sure who was going to buy their produce from the market stall. Also, the interviews with Greek producers showed that the majority of the producers were not aware of what their customers' needs and wants. Therefore, market turbulence is another turbulence factor that is relevant to the Greek ASC.

## 6. Conclusion

This paper presented insights from an exploratory study conducted to identify the main environmental turbulence factors in the Greek ASC. Using CT and sixteen semi-structured interviews the relevant environmental turbulence factors of the specific context have been identified. The interview analysis validated the existence of three major factors that create environmental turbulence in the Greek ASC from a producer's perspective which are as follows: regulatory, competitive and market turbulence.

The main limitation of this study is that we included only producers from one country (i.e. Greece). However, the aforementioned limitation is overcome by the nature of this research, as environmental turbulence factors should be examined in a specific context to get generalizable results for a specific population. The next step is to operationalize those factors and deploy a nation-wide survey in order to have results that could be generalized across the Greek producers. Also, through the data analysis of the aforementioned survey the relationships of the identified environmental turbulence factors could be tested with the collaboration-PHFL relationship to see the effect. Future research should also get perspectives about the environmental turbulence factors from other actors in the supply chain (i.e. wholesalers, cooperatives and retailers).

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