Expanded abstract

Innovation and Efficiency in Agri-food Cooperatives: The Influence of Information Technology and Knowledge-Oriented Leadership

Objectives

Agri-food cooperatives play a crucial role in economic and social development, especially in rural areas, acting as economic, social, and cultural drivers in less populated regions. One of the main challenges in rural areas is their capacity to face digital transformation, a determining factor for their competitiveness and survival in the global market in the medium term. Cooperatives cannot remain on the sidelines of this progress and to stay in the market they must be at the forefront through their capacity for innovation. This progress must be promoted from the management, where leaders must recognize the importance of digital technologies to improve both economic and social efficiency, and be integrated into specific processes of the cooperative. Thus, through a knowledge-oriented leadership style, leaders can facilitate knowledge sharing and collaboration among employees by providing them with the necessary resources and incentives, promoting cross-functional collaboration and generating new ideas for innovation.

Therefore, and with the intention of exploring initiatives that help to improve the competitiveness of cooperatives, it is necessary to investigate how the identified variables (information technologies, innovation capacity and knowledge-oriented leadership) can improve the efficiency of agri-food cooperatives. In this sense, this study aims to analyze how information technology, innovation capacity, and knowledge-oriented leadership contribute to improving the efficiency of agri-food cooperatives. While previous research has extensively examined the relationship between these factors in traditional business contexts, their specific implications for cooperative organizations remain underexplored. Given the increasing competitiveness of the global market and the necessity for cooperatives to enhance their efficiency, this study seeks to provide a deeper understanding of these interrelations.

Methodology

In order to understand how information technologies, innovation capacity and knowledge-oriented leadership influence the efficiency of agri-food cooperatives, it is essential to use appropriate methodologies. Quantitative approaches seek to obtain precise measurements that allow statistical analysis, seeking objectivity. These methods are appropriate when variables

can be measured directly, and conclusions can be inferred from representative samples of the population. However, the complexity of cooperative systems and the nature of the causal relationships between the variables considered in this study mean that exclusively quantitative approaches may be insufficient to capture the full richness of the phenomenon under study.

In this way, a qualitative research approach was employed, utilizing Fuzzy Cognitive Maps (FCM) as a methodological tool. FCM enables the graphical representation of expert knowledge and the inference of cause-and-effect relationships among the analyzed concepts. The study involved a panel of 20 experts in the management of Andalusian agri-food cooperatives. The selection has been made according to criteria of territorial and sectorial representativeness, ensuring the validity and reliability of the results. All of them have more than 20 years of experience and represent a diversity of strategic sectors (olive, red fruits, fruit, horticulture, cereals, livestock, wine and avocados), thus guaranteeing a comprehensive analysis of the agri-food cooperative sector. The panel is composed of 17 men and 3 women, showing the marked masculinization in the management of agri-food cooperatives, a relevant aspect in the analysis of gender equity in the sector. The experience and heterogeneity of the panel ensure the soundness of the results.

The research process employed encompasses the following steps: 1) literature review to identify key variables influencing efficiency in cooperatives; 2) development of an initial set of concepts related to IT adoption, innovation capacity, and KOL; 3) integration of expert insights into the FCM, allowing the identification of causal relationships and the measurement of their impact on cooperative efficiency; and 4) simulation of various scenarios to assess the influence of IT and leadership styles on cooperative innovation and efficiency.

Results

The findings reveal that KOL has a strong positive correlation with both innovation capacity and overall efficiency in cooperatives. IT plays a crucial mediating role, facilitating both radical and incremental innovation. Specifically, cooperatives with a low degree of digitalization have a lower capacity for radical and incremental innovation and also achieve lower levels of organizational efficiency. This is probably because they are not taking advantage of the competitive advantages offered by IT, which makes it difficult to develop certain actions. In contrast, cooperatives with a medium degree of digitalization show higher levels of innovation and efficiency. The highest levels of innovation and efficiency are found in those cooperatives with a high degree of digitalization.

However, the FCM results show that organizational innovation and efficiency not only depend on the degree of digitalization of the cooperative, but also on the presence of KOL styles in the cooperative. In this sense, once it has been identified that cooperatives with a high degree of digitalization show the highest values in innovation and efficiency, the extent to which the incorporation of knowledge-oriented leadership styles leads to better results will be analyzed.

Despite these insights, the study is not without limitations since it is based on expert opinions, which, while highly valuable, may introduce subjective biases. Moreover, the sample is limited to Andalusian agri-food cooperatives, requiring caution when generalizing findings to

other regions or cooperative sectors. Based on this, future research should delve deeper into the relationships between IT, innovation capacity and KOL in improving the efficiency of cooperatives.

Conclusions

This study underscores the strategic importance of IT and KOL in enhancing the efficiency and sustainability of agri-food cooperatives. Therefore, cooperatives must actively invest in IT infrastructure and employee training to harness the full potential of digital transformation, and KOL should be promoted at all organizational levels to foster a culture of innovation and collaboration. In this sense, cooperative governance structures should integrate IT and leadership strategies to optimize decision-making processes and resource allocation. Additionally, policymakers should support cooperative digitalization initiatives to bridge technological gaps and enhance sector competitiveness.

This research contributes to existing literature by providing novel insights into the interplay between IT, innovation, and KOL within agri-food cooperatives. This work also helps to reduce the existing gap in literature, since little research has focused on leadership in cooperatives. Additionally, to the best of our knowledge, there are no papers that have analyzed the influence of LOC on innovativeness and efficiency cooperative.

Unlike traditional corporate studies, this study emphasizes the unique governance structures and operational dynamics of cooperatives, offering practical recommendations for improving their efficiency. By applying FCM methodology, the study presents a robust framework for assessing complex causal relationships in cooperative management. Ultimately, this research highlights the critical role of IT and leadership in fostering sustainable and competitive cooperative enterprises in the modern agricultural economy.