Strategic management transformations: Designing a strategic digital framework to enhance the big crop farms' performance in Romania.

Summary

The thesis reviewed the key aspects of a strategic digital framework for agriculture: strategic vision, ecosystem and networks, digital infrastructure and platforms, farmer's willingness to adopt and to pay for the new technology as well as sustainability aspects. It examines why and how digital agriculture is a strategic response to the long-term development needs of the Romanian agriculture.

It argues that farmers' willingness to adopt and pay for digital tools is a key determinant of the Romanian agricultural sector's capacity to modernize, improve its competitiveness, and make it possible to aim for sustainability objectives aligned with the European Green Deal and Romania's National Strategic Plan (European Commission, 2019, 2020, 2021, 2022; MADR, 2022, 2024).

The research associated with the thesis is modeling quantitatively the drivers of farmers' willingness to adopt and pay (WTA an WTP) for digital agriculture tools and services, answering the following research questions:

RQ1. What are the drivers that would make Romanian big crop farmers to adopt digital agriculture tools/services?

RQ2. What are the drivers that would stimulate Romanian big crop farmers to invest or pay for digital agriculture tools/services?

The study is a premiere in the Romanian research landscape filling in fundamental knowledge gaps. The evolved Unified Theory of Acceptance and Usage of Technology (UTAUT2, Venkatesh, Thong & Xu. 2012) model was never used before in Romania to assess Willingness to Pay (WTP) for Internet of Things (IoT) usage. The study is also pioneering the quantitative studies on digitalization drivers in the Romanian farms, filling an important knowledge gap in Romania and also contributing to the global know-how on the topic, being second only to Shi et al. (2022). The associated research article about the proposed usage of the UTAUT2 for assessing Romanian

farmer's motivation for digitalization (Markovits, 2024a) was cited in Romanian academic papers about farmers and also inspired studies on digital agriculture in other countries in Europe (Boshnjaku et al., 2025).

The thesis chapter structure is as follows:

Table 1. Chapter structure and purpose

Chapter	Focus	Contribution
Research Context: Romania's Agricultural Opportunity	Romanian agriculture status / perspectives and EU policy	Shapes the Vision of the 2050 Romanian agriculture and shows why digitalization is strategically necessary
Background Literature Review	Digital transformation, digital agriculture and adoption theories,	Identifies the conceptual and empirical gap
Research Methodology	UTAUT2 and PLS-SEM design	Builds a context adapted research model
Research Results and Discussion	Determinants of adoption and payment	Explain the factors influencing investment
Conclusion	Synthesis and implications	Links findings to practice and policy

The thesis introduction states that Romanian farms have undergone profound transformation in the post-communist period and especially after the EU accession in 2007. Nowadays, farms operate as commercially integrated enterprises whose success depends on strategic resource allocation, operational efficiency, and market positioning (Phillipson et al., 2004; Tey & Brindal, 2015).

Farms are situated in the broader stakeholder ecosystem of input suppliers, consultants, financing institutions, traders, processors, policy makers (Romanian and European) as well local communities (Reed et al., 2009) to show how value can be created not only through yields but also through logistics, differentiation and responsiveness to markets (Porter, 1985;Trienekens, 2011).

Performing farms are the grassroots constituents of a performing agricultural sector in a country's economy. Farms anchored in strong stakeholder ecosystems, with optimized value chains and aided by trustworthy decision-making frameworks are best positioned to thrive in todays and future agricultural landscape. Farmers in today's Romania, in their daily activity navigate local and global challenges more so than ever before (Flachs & Richards, 2018; Silverstein, 2020; Atosina Akuriba et al., 2021). To manage their business, most often family owned SMEs, they must use a mix of traditional and contemporary agricultural knowledge combined with economic and even political acumen relying on adaptability to achieve resilience.

Updating the traditional farming knowledge (as learnt from inter-generational practice) with the scientific advancements in both agricultural sciences and firm management enables individual farmers or farming communities organized in associative structures (i.e. cooperatives) to use adaptive strategies that are applicable to their specific environmental and socio-economic contexts (Utami et al., 2024; Yang et al., 2024).

Decisions in the farms are influenced by climate volatility, pest risks, agricultural inputs and output commodities price fluctuations as well as policy changes (McCown, 2025; Getahun et al., 2024). This makes the use of decision support tools more and more relevant thus digital agriculture tools become instrumental for managerial quality and resilience.

Research context – The Romanian agricultural opportunity

Policy and economic strategy documents were studied as well as prominent academic papers related to the state and perspectives of agriculture (Steriu et al., 2013; Sauer & Moredu, 2020; Bremer et al., 2021;Chereji et al., 2022; Feher et al. 2022; Chitea, 2023; Alexandri et al. 2024) The possible and desirable development of the Romanian agriculture by the 2030 and by the 2050 horizons as well as the relevant national and European Union policy frameworks are analyzed (European Commission, 2019, 2020,2021, 2022; MADR, 2022, 2024).

Agriculture is becoming a comprehensive indicator of the overall economic development of a country making the link between economic performance, environmental sustainability, and social welfare (Béné et al., 2022, Sehgal & Batool, 2024). In the day to day practice, agriculture is de facto a multidisciplinary domain. It relies on, while simultaneously showcases, the development of life sciences and chemistry, the sophistication levels of the industries providing the tools, the

development level of the banking and financial services and the development level of the trading services available for securing inputs on one side and the valorization of crops on the other side.

Digital agriculture is deemed to play a crucial role in creating a sustainable agricultural sector in an EU member Romania. According to Rodino et al. (2023) digital transformation enhances productivity, improves product quality, and supports economic growth in the agricultural sector. The transformation of agriculture through digitization will bring and require significant changes in management and production processes. The same authors state that the digitization of agriculture will be significantly influenced by: Government policies, market dynamics, technological advancements, and access to capital.

The adoption of precision farming techniques for Romanian crops, which use data analytics and smart technologies, can significantly improve resource efficiency and boost yield outcomes (Păcurar et al., 2025), thus addressing the challenges posed by climate change, outdated farming methods and land fragmentation.

Literature review

The global literature pertaining to key topics of farms' strategic management such as digital transformation, value creation, change management, digital agriculture and decision support systems was reviewed. The chapter includes also a closer look at the digital agriculture literature landscape in Romania and identifies a significant gap in modeling the drivers of digital agriculture adoption in Romania.

Multiple bibliometric maps were created using VOSViewer (van Eck & Waltman, 2010) illustrating thus the realm of the literature on digital transformation, value creation, change management, agriculture 4.0, agricultural decision support systems with dedicated maps to the Romanian digital agriculture literature.

Literature review as well as bibliometric analysis showed that despite being a recent years' topic, digital transformation literature is expanding very fast, with an increasing share for the business and management perspective on the subject. The opinion that digital transformation is rather the business strategy for a digitized world, and technologies are enablers, is gaining strength and prominence.

The bibliometric maps, the definitions and the review articles published in the recent three to five years prove that digital transformation is more and more, rightfully, considered a value creation method.

Change management is still not so strongly linked to digital transformation in the bibliometric maps. Nevertheless, the literature published after 2018 includes more opinions that suggest that successful digital transformation initiatives should rely on and use the change management methodologies.

The literature review on precision agriculture, agriculture 4.0, smart farming, and decision-support systems showed that adoption depends on organizational readiness, trust, perceived value, and institutional support.

Research Methodology

The underlying research model was inspired by similar studies done in Europe and Asia while relying on the Unified Theory of Acceptance and Usage of Technology. The questionnaire was adapted to the Romanian realities with the help of local advanced practitioners.

Inspired by Shi et al., (2022) as well as Rose et al., (2016) in line with the author's' published proposal (Markovits, 2024a) and the author's subsequent qualitative work, the underlying research model of this thesis is an UTAUT2 extended model that was also localized and has the below map of constructs and the accompanying hypotheses (figure 35):

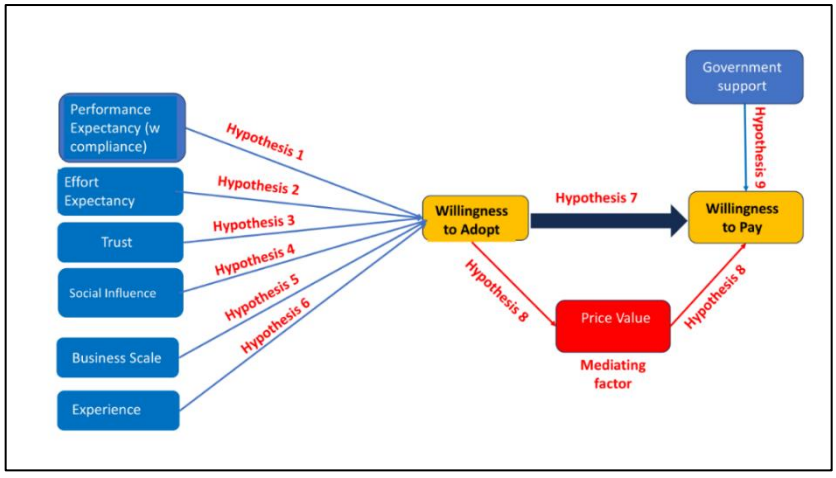


Figure 35. Constructs and hypothesis map

Research Results and Discissions

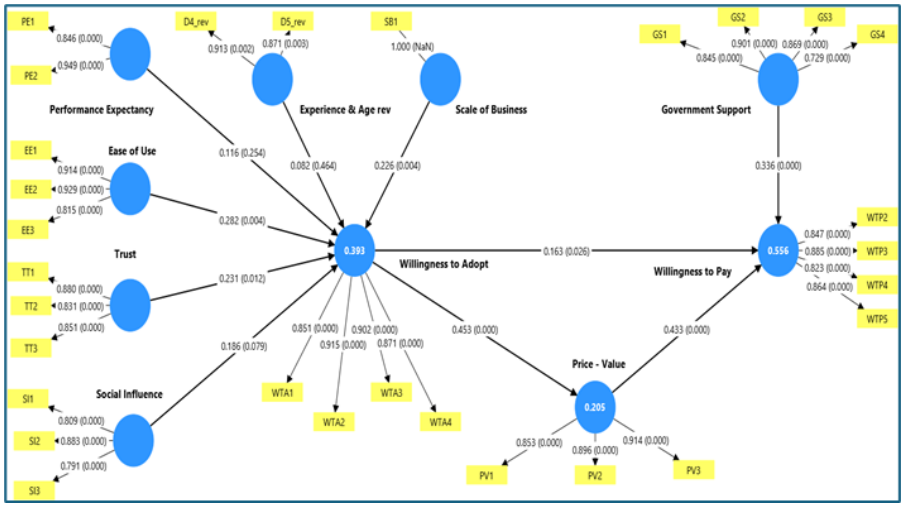
These hypotheses were tested with the help of partial least square structural equation modeling (PLS-SEM) and SmartPLS4 software (Ringle et al., 2024).

	Formulation	p value	f^2 value	Status
H1	Performance Expectations (PE) link positively to the Willingness to Adopt (WTA) digital agricultural tools	0.254	0.018	Not confirmed
H2	Ease of Use expectations link positively to the Willingness to Adopt (WTA) digital agricultural tools	0.004	0.096	Confirmed
H3	Trust in the digital systems links positively to the Willingness to Adopt (WTA) digital agricultural tools	0.012	0.052	Confirmed
H4	Social influence factors impact positively on the Willingness to Adopt digital (WTA)agricultural tools	0.079	0.052	Not confirmed
H5	Business scale links positively to the Willingness to Adopt (WTA) digital agricultural tools	0.004	0.08	Confirmed
H6	Younger Age and less experience links positively to the Willingness to Adopt (WTA) digital agricultural tools	0.464	0.011	Not confirmed
H7	Willingness to Adopt (WTA) impacts positively the Willingness to Pay (WTP) for digital agricultural tools	0.026	0.047	Confirmed
H8	The Price Value perception mediates the impact of the Willingness to Adopt (WTA) on the willingness to pay for digital agricultural tools	0.0	0.258/0.256	Confirmed
H9	Government financial and fiscal supports (GS) impact positively the Willingness to Pay (WTP)for digital agricultural tools	0.0	0.188	Confirmed

The hypothesis that performance expectations (PE) will influence behavioral intent to adopt digital agricultural tools (WTA), unlike the general learning from the UTAUT literature, was not confirmed in this study. One possible explanation could be the fact that farmers in the sample, who are very close to the subject given their enrollment in modern agriculture classes expect more than performance to materialize in order to get them convinced to adopt digital agriculture. This is

also a likely explanation for the almost no impact of the social influence (SI) on adoption (WTA). The non-validation of hypothesis 6 comes with the good news that age and experience do not have an influence on adopting digital agriculture (WTA).

Price- Value (PV) and Government Support (GS) are the major drivers in the model illustrating farmers' strong attention to cost and their significant reliance on Government's financial aid, fiscal incentives as well as legislative and regulatory support.



These learnings are aligned with positions stated also in Romanian Government sponsored studies (Rodino et al., 2023). They are very important learnings, proven quantitatively in one of the few studies done directly with Romanian farmers. The insights validated by this study elucidate managerial and marketing aspects for digital agriculture tools manufacturers and promoters using the UTAUT2 as a behavioral model. The study insights also have imperative ramifications in the policy making domain, suggesting that public policy, subsidies, training and enabling infrastructure can lower significantly the digital investment barrier.

Beyond the empirical model, the thesis puts forward the Sustainable Value Creation Diamond as a balanced decision making framework. It was inspired and developed as part of the work in this thesis, and it is also aligned with the principles and recommendations of the more recently adopted ESG reporting and governance framework of the European Union.