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The Impact of Knowledge Acquisition on the Earliness of Innovation Adoption: A Case Study of German Grape Producers

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◦*Purpose: The purpose of this study is to explore how grape producers acquire knowledge of innovations in viticulture by using various information channels. Further, the transformation and application of knowledge into an earlier adoption of innovations are investigated.*

◦*Design/methodology/approach: A survey addressing German grape producers was conducted to collect data on knowledge acquisition and the relative earliness of innovation adoption. Following the theoretical concept of the individual absorptive capacity* (Zahra and George, 2002)*, a structural equation model was assembled to determine the relative earliness of adoption.*

◦*Findings: The investigated information channels contribute to different extents to the acquisition of knowledge on innovations in viticulture. In general, it was found that social interaction has a large impact on individual knowledge. Moreover, the earliness in adopting innovations can be predicted by knowledge and the interaction with peers.*

◦*Practical implications: The study bears several practical implications. Proactive interaction within the industry can increase knowledge of specific innovations. In addition time advances can be gained by interacting in the industry. In general, viticulturists who interact more in the industry learn earlier about innovations and can adopt novelties before competitors do. This can lead to first-mover advantages through comparative cost-advantages in production.*

Keywords: Innovation, Knowledge, Adoption, Information Channels, Absorptive Capacity

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1. INTRODUCTION

The German wine industry experiences an ongoing structural change. Over the last decade the number of viticulturists declined by 30 % (BMELV, 2012) despite an unchanged acreage under vine. In course of this development, a small number of viticulturists accumulate land while a large number of part-time and small viticulturists are diminishing. Related to this structural evolution is a variation in information behavior and intensity of interaction within the industry. This leads to an uneven distribution of knowledge about viticultural innovation and to differing adoption rates within the population of viticulturists (Giuliani, 2007). In this study we argue that the process of knowledge acquisition and its transformation also affects the relative earliness of innovation adoption compared to competitors. Knowledge is therefore also crucial for first-mover advantages in viticulture. Earlier adoption of innovations can imply comparative cost advantages in production. Thus it can be argued that early adopters will produce more profitably and have the capability to outperform their competitors over the long run (Sunding and Zilberman, 2001, Cochrane, 1958).

2. THEORETICAL BACKGROUND AND HYPOTHESES

2.1 Past Research

The interrelation between learning, knowledge and the adoption of innovations was content of various publications within the wine industry (Giuliani, 2005, Giuliani, 2007, Bell and Giuliani, 2007, Giuliani, 2011, Morrison and Rabellotti, 2009). These studies used social network theory and related statistic methodology to evaluate and explain the distribution of knowledge among populations of viticulturists. The aspect of time advantages that can be gained by interaction and knowledge acquisition was not examined by these studies.

Past research in the wine industry also stressed the sourcing of information and its application. McDermott showed that the number of ties that a company has with other companies and organizations in the industry, is positively related to product upgrading (McDermott et al., 2009). In addition to this result Vargas empirically showed that the importance of different sources of information varies (Vargas, 2000). This finding is supported by Lorentzen who argued that also the intensity by which an information source is used should be taken into account (Lorentzen, 2011).

2.2 Knowledge and Innovation

The interrelation between knowledge and the time at which an innovation is adopted by a company can be explained by two theoretical concepts: 1. Rogers' model of the diffusion of innovation that explains the spreading of information on novelties within social systems. 2. Cohen and Levinthal's concept of the individual absorptive capacity which emphasizes on the assimilation and application of knowledge (Rogers, 2003, Cohen and Levinthal, 1990).

Diffusion research suggests that the adoption of Innovations can be explained by communication processes of various individuals within a social system (Rogers, 2003). Rogers' model can be seen as interrelated to network theory. With increasing interconnectedness, i.e. number of ties to other individuals in the industry (McDermott et al., 2009) and the intensity by which these ties are used to generate new knowledge (Lorentzen, 2011) the probability that a

unit of adoption learns about an Innovation and implements it earlier in its company increases. Rogers' diffusion model is therefore capable to explain the earliness of adoption. However, the model falls short in explaining the cognitive processes that underlay the generation and application of knowledge (Albrecht, 1973).

The theoretical concept of the individual absorptive capacity can extend Rogers diffusion model. It was introduced by Cohen and Levinthal (Cohen and Levinthal, 1990) and has been followed by numerous case studies in different fields of research. The body of empirical literature on absorptive capacity was later reviewed by Zahra and George. The authors found that one should distinguish between the so called potential and realized absorptive capacity. The former stresses on the use of various knowledge sources, whereas the latter focuses on transformation of knowledge into innovative activities (Zahra and George, 2002).

2.3 Hypotheses

Based on Zahra and George's model it can be assumed that viticulturists assimilate new knowledge by interacting in the industry. In general, a viticulturist who is better interconnected in the industry, and uses various information sources more frequently, will have more knowledge on viticultural innovations. This constitutes the so called potential absorptive capacity (Zahra and George, 2002).

> H_1: The frequency by which a viticulturist attends industry events affects the knowledge he/she has of innovations in viticulture positively.
> H_2: The frequency with which a viticulturist uses certain media to get informed affects the knowledge he/she has of innovations in viticulture positively.
> H_3: The frequency with which a viticulturist interacts with his colleagues affects the knowledge he has of innovations in viticulture positively.

The transformation of knowledge into innovative activities has been described by Zahra and George as realized absorptive capacity (Zahra and George, 2002). Accordingly the following hypothesis can be postulated:

> H_4: The more knowledge a viticulturist has on innovations the earlier he/she adopts an innovation.
> H_5: The more a viticulturist interacts with his colleagues (peers) the earlier he/she adopts an innovation.

A structural model of the above mentioned hypotheses can be found in figure 1.

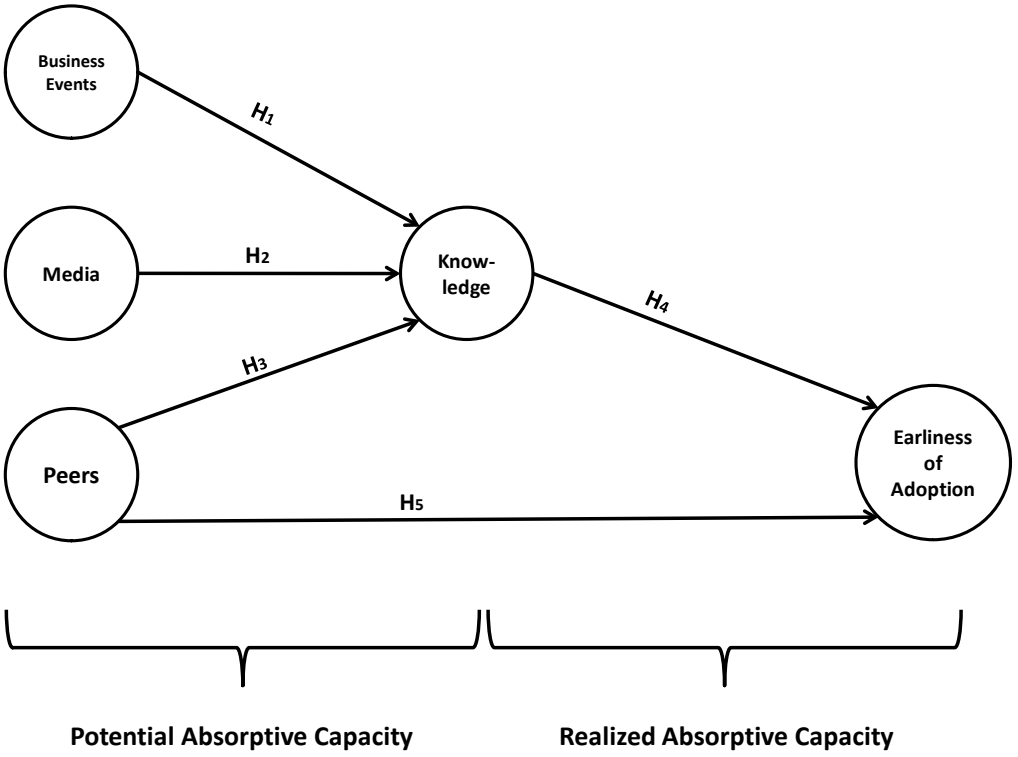

Figure 1: Structural Model

3. METHODOLOGY

3.1 Survey

This investigation is based on a case study of viticulturists in Germany's second largest wine growing region – Palatinate. The study focuses on a mail survey addressing solely grape producers. The distributed questionnaire included varied indicators measuring how frequently different information channels (i.e. business events, media, and peers) are utilized to source information on innovations in grape production. In addition, the viticulturists self-assessed when they usually adopt innovations in comparison to their colleagues. In total 123 responses could be utilized for the statistic assessment.

3.2 Structural Equation Modeling

The statistic assessment of the above mentioned hypothesis was conducted by assembling a structural equation model (SEM). A partial least squares (PLS) approach was applied by using the software SmartPLS (Ringle et al., 2005). Within the model formative constructs were used to constitute the impact of business events and media. A reflective model measures the knowledge of the viticulturists. Since the nature of the study is in an exploratory stage, the model also relies on single item constructs (Hair et al., 2013). The hypotheses underlying the SEM were tested for their significance by bootstrapping. T values indicate the significance level of the paths in the SEM (Hair et al., 2013).

4. RESULTS

The structural model presented in this study is based on the above mentioned hypotheses and contains two parts describing the potential absorptive capacity and the realized absorptive capacity. The first part of the model constitutes how knowledge on innovation can be predicted by different sources of information. The measurement model 'Knowledge' is affected by three information sources 'Business Events' (H_1), 'Media' (H_2) and 'Peers' (H_3). The path coefficients displayed in table 1 confirm the underlying hypothesis. The attendance of business events has the strongest influence on knowledge of innovations. The path coefficient has a regression weight of 0,2861*** and is highly significant. The effects of media (0,1853**) and peers (0,1729**) are almost similar. Both path coefficients are also significant. These three exogenous variables can explain almost 30 % of the variance of the measurement model 'Knowledge' (R^2=0,294).

The second part of the model constitutes how knowledge is transformed into innovative activities. In this study the endogenous variable 'Earliness of Innovation Adoption' is predicted by two exogenous variables -'Knowledge' (H_4) and 'Peers' (H_5). Both paths display significant path coefficients. The effect of 'Knowledge' (0,5134***) on the 'Earliness of Adoption' is stronger than the impact of 'Peers' (0,2243***). More than 40 % of the variance (R^2= 0,412) in 'Earliness of Adoption' can be predicted by the two exogenous measurement models.

Hypothesis		**Path Coefficient**	**T Statistics**
H_1	BusinessEvents -> Knowledge	0,2861***	3,1199
H_2	Media -> Knowledge	0,1853**	2,3994
H_3	Peers -> Knowledge	0,1729**	2,0211
H_4	Knowledge -> Earliness of Adoption	0,5134***	7,6326
H_5	Peers -> Earliness of Adoption	0,2243***	2,9643
Coefficient of Determination			**R^2**
	Knowledge		0,294
	Earliness of Adoption		0,412

Table 1: Hypotheses and Path Coefficients

5. DISCUSSION AND PRACTICAL IMPLICATIONS

The results of this study confirm that proactive networking within the industry is a key determinant to adopt innovations earlier than the majority of the industry. The attendance of business events appears to be the most powerful source to acquire knowledge of innovations. Beyond that the interaction with other viticulturists not only contributes to the dissemination of innovative knowledge, it also affects the time at which an innovation is adopted. There are different conclusions that can be drawn from this statistical relationship. Firstly, the interaction with peers might constantly expose viticulturists to competitive pressure (peer pressure). If a colleague adopts an innovation successfully, others will see a need to adopt the innovation as

well to prevent themselves to not lag behind. Secondly, peers might also be important supporters in the implementation stage of innovations. For instance, early adopters can learn from the experience of innovators who implemented the innovation first.

This study is limited on knowledge acquisition and the earliness of innovation adoption. The effect of earlier adoption on the cost structure of grape producers was not investigated. Additional empirical research is necessary to explain how earlier adoption can lead to comparative cost advantages in viticulture and can therefore lead to competitive advantages. Theoretical explanations can be found in Cochrane's agricultural treadmill theory (Cochrane, 1958, Sunding and Zilberman, 2001, Koester, 2010).

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APPENDIX

Measurement Models/Indicators	**Formative Models**	**Reflective Models**	**Single Item Models**	
	Outer Weights	Outer Loadings		T-Statistics
Media				
Industry related magazines	0,8843***	-	-	10,69
Newsletters/circular letters	0,1997 n.s.	-	-	1,5193
Internet	0,2262 n.s.	-	-	1,4277
Business events				
Trade fairs	0,4027**	-	-	2,4808
Meetings at cooperative	0,259*	-	-	1,6593
Industry events	0,5792***	-	-	3,4142
Knowledge				
Advantages and disadvantages of innovations	-	0,8674***		25,7838
Knowledge of new viticultural equipment	-	0,8925***		52,9973
Peers	-	-	1	0
Earliness of Adoption	-	-	1	0

***p<0,01, **p<0,05, *p<0,1