Innovation Management in Wine Business – Need to Address Front-End, Back-End, or Both?

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In order to provide needed orientation of innovation management in the SME wine industry, a multi-case study was realized. The innovation activities of four German wineries for their entire value-creation coverage were analysed. The focus of the study was on an apparent challenge whether wineries should emphasise viticultural (back-end) or marketing and sales (front-end) innovations. The results of the four cases analysed suggest that innovation matters, strategic positioning influences each wineries’ innovation portfolio, winery size and organization impact the innovation portfolio, resource dependency can be reduced through cooperative action at the industry level, and smaller producers must leverage their entrepreneurial orientation. All integrated wine producers need to address front- and back-end innovation, but with flexibility for innovation accentuation and individual innovation portfolios. Wineries also need to recognize the synergetic value of two different challenges: (1) convincing products require optimal planting and farming whereas (2) the product assortment and its treatment should consider customer profiles. Hence, front- and back-end innovations need to be synchronized and considered in parallel, without ignoring each winery’s strategic accents and therefore individualization of the innovation portfolio. A synergetic innovation approach, exploiting technology and data mining, can foster the development of competencies and best practices when using existing wine industry resources and capabilities. Knowledge exchange at the industry-level helps producers reach consensus on innovation activities, goals, and strategies, and to improve the business ecosystem by identifying elements that are obsolete or ripe for change.

1. INTRODUCTION

Innovation is about introducing something new. Novelty can be in different forms, e.g. an idea, a product, a process or a method. Innovation thereby results not only from research, new technology, and the natural sciences but also from the economics and management sciences in that they are social phenomena that emerge from attempts to meet the needs of individuals as well as society as a whole (Lucke, 1995; Schumpeter, 1939). Innovation is considered a panacea to compete in today’s competitive markets and is therefore defined to be key for companies to develop, grow, position, and sustainably secure profitability in competitive business environments, especially where there are changing customer needs (Crossan & Apaydin, 2010; D’Aveni, 1994; Denton, 1999; Hauschildt, 2004; Jenssen & Jorgensen, 2004; Johannessen et al., 1999; Wang & Ahmed, 2004).

Firms, in their quest for competitive advantage, innovate by developing new products, as well as new product-related services and manufacturing technologies, and by implementing innovative organisational concepts (Kirner et al., 2009; Le Roy et al., 2018). Innovation serves to exploit value creation potential (Adner & Kapoor, 2010). It is in the interest of economies and societies to create new solutions and tap new needs by innovation (OECD, 2004; Van de Ven, 1986). Industries hence increasingly evolve from being factor-oriented to become innovation-driven (Prajogo & Ahmed, 2006; Woodward, 2005). Digitalization serves hereby as an illustration, that innovation is a goal, a lever, a driver for change, but also a possible solution (Agostini & Filippini, 2019). The pressure to innovate requires a holistic perspective of firm’s knowledge capabilities with public policies and industrial structures (Camisón & Monfort-Mir, 2012; Pang et al., 2019). In practice, innovation is a complex phenomenon embedded in multi-level innovation systems (Lundvall, 1992). Especially agricultural industries rely on innovation to cope with increasingly volatile and often destructive natural phenomena. In regards to the wine industry, players are deemed to not only innovate to manage potential external risks but also to be able to compete in international consumer markets and against a wide variety of substitute products (Aylward, 2006; Aylward et al., 2006; Granata et al., 2019; Rama & von Tunzelmann, 2008). Addressing innovation from an upstream perspective (activities close to the exploitation of natural resources and therefore viticulture)—hereafter termed back-end innovation, and a downstream perspective (securing market access and customer acquisition and loyalty)—labeled as front-end in-
novation stretches the innovation portfolio of wine estates (Singer & Donoso, 2008).

Examining the innovation portfolio of wineries allows us to assess actual innovation activities. It provides information on innovation diffusion and in case a firm launches several innovations, the innovation intensity of the firm’s portfolio can be explored. The German wine industry is characterized by fragmentation and predominantly small companies (BMEL, 2016, 2021; BMELV, 2012; DWL, 2020; Loose & Pabst, 2018). Acknowledging that small enterprises suffer a comparative disadvantage in resource access compared to large companies (McGee, 2000) and an apparent stretch to address up- and downstream innovation for vertically integrated wine producers motivated an explorative multi-case study to assess their innovation strategies.

Four German wineries compose the basis for analysis. Case data was gathered in a time span from November 2019 until March 2021. Multi-case research methodology is appropriate when exploring entrepreneurial aspects, such as innovation strategy of SMEs, “...since the researcher does not impose a priori categories or hypotheses, but rather attempts to understand phenomena based on field research” (Dana & Dana, 2005). An iterative interviewing of the managers and owners of the four wineries and winery visits served to gather the status of innovation in the German wine industry from the perception of interviewees, a merged view of the four cases, and a comparison of the innovation portfolios of the participating wineries. The case analyses were combined with expert interviews. This approach allowed for the mapping of an innovation landscape when assessing each individual winery and asking the interview partners to state and rank current innovations in the industry.

This investigation consisted of iterative interviews and communication with the managers and industry experts. The drawn landscape of innovation does not claim to be exhaustive, neither objective, nor of long-term validity. It served as a means to compare the wineries and to shed light on the innovation portfolio of the participating wineries. For practitioners, the drawn map can serve to assess their degree of innovativeness. The multi-case approach allowed for the identification of innovative measures at each step of the value-chain, interact with the case owners on their respective innovation strategy, validate innovation aspects for each winery, and create a comparison across the case studies (Eisenhardt, 1989; Gilinsky et al., 2016; Marion et al., 2012; Yin, 2008). All four cases represent small to medium sized entities in the German wine industry, covering value-creation from wine production to sales.

Managerial demand to manage innovation is high, considering increasing complexity, financial burdens, shorter product life cycles, and digitalization in the wine industry. Especially small and medium sized enterprises with limited resources need to manage innovation wisely. Resource dependency might limit innovativeness and strategic innovation decision making. Innovation portfolio should be a strategic result and not one of imitating peers. The goal of this research is not only to understand innovation in the industry but also, more importantly, to apply a strategic and business ecosystem perspective to the German wine business for the purposes of adding knowledge to the less searched field of strategic innovations. Practitioners in the entrepreneurial wine industry are apparently pushed to be innovative (Dressler, 2015). Innovativeness in the wine industry is not about being innovative per se but rather it is about investing wisely and deciding in which activities of the firm to innovate or not. Indeed, all four wineries were active in all value-chain process steps and engage in front-end (close to the customer) and back end (viticulture-oriented) innovation.

By analysing the innovation portfolios of each winery, the multi-case approach allowed for capturing both innovation breadth and depth. The analyses intended to contribute to explore each firm’s (a) innovation strategies and profiles of innovation, (b) status of innovation diffusion, and (c) to explore barriers and levers for innovation in the light of resource dependency. Exploring limitations in resource access or asymmetrical power situations determine strategic decisions such as innovation activities (Barney, 2001). The cases hereby allowed to explore innovation strategies from the back end (wine production) to the front end (customer end) of the value creation steps.

The innovation strategies of the analysed wineries speak for the need to cover both innovation perspectives but also to synchronize the two. The larger and cooperatively organized winery showed highest innovation activity levels, also for the back- and front-end innovation measures of all cases. The findings can be explained with their superior resource access and overcoming resource limitations. A result of this fruitful interaction with the winery owners over the course of this study was a jointly created innovation map that indicated that joint approaches, exchange, and cross-winery learnings are a lever for innovation diffusion and value creation in innovation ecosystems (Kenney et al., 2020).

2. LITERATURE REVIEW

Firm innovation is a vastly studied research topic which has led to a well-developed innovation research stream (Adner & Kapoor, 2010; Calantone et al., 2002; Chesbrough, 2010; Crossan & Apaydin, 2010; Danneels, 2002; Glynn, 1996; Hauschildt, 2004; Jenssen & Jorgensen, 2004; Knight & Cavusgil, 2004; Le Roy et al., 2018; Prajogo & Ahmed, 2006; Salavou, 2004; Schneider & Spieth, 2015; Wang & Ahmed, 2004). Initially, innovation studies focused on larger organizations (Caputo et al., 2002; Gilinsky et al., 2008; Vermeulen et al., 2005), yet recent studies have increasingly focused on small- and medium-enterprises (SME) (Friel, 2005; Saunila, 2020). The literature provides empirically-based recommendations for innovation management of SME innovation processes (Scozzi et al., 2005), for the food and beverages industry (Rama & von Tunzelmann, 2008), herein the wine industry (Gilinsky et al., 2008), and even focal areas in innovation management such as sustainability oriented innovation practices in the wine business (Lubell et al., 2011). Indeed, research on innovation in the context of SMEs and especially in the wine industry is on the rise (Crossan & Apaydin, 2010; Orth et al., 2007).

In the agricultural sector, the innovation process has specificities compared to the innovation process in other
productive sectors. The agricultural value chain consists of upstream activities of planting, growing, harvesting, and production, as well as downstream activities to create and cater to market demand (Singer & Donoso, 2008). Within the agricultural industry, wine benefits from being a product of emotional utility, and therefore high value-creation potential in the downstream activities, evidenced by the range of wine prices (Ashton, 2011; Lecat et al., 2017; Rössel, 2012; Schnabel & Storchmann, 2010; Storchmann, 2012). Societal changes, digitalization, increasing knowledge, and technological advances allow wineries to create new offerings and a formerly unknown variety of offerings. Innovation-driven downstream activities potentially create a challenge for upstream innovation and may limit the ability to meet market expectations in light of the complexity, dependency, or conflicting targets inherent in innovation processes (e.g. upstream-innovation for cost savings) (Carter, 1990; Roy & Sivakumar, 2010). As a result, there is a potential innovation stretch when intending to be innovative in all value-creation aspects (i.e. front-end and back-end innovations). In the wine industry, vertically integrated wineries need to address both perspectives also from an innovation management perspective. Indeed, innovation diffusion depends on both perspectives and their mutual interaction (Rogers, 1995). Gains from technological innovation are quickly passed on to consumers because in a fully commercialised economy demand and supply are engaged in a price race and, consequently, an income distribution race: a so-called "agricultural treadmill" (Cochrane, 1958). In effect, this means that the only way for agricultural producers to obtain higher prices and avoid business failure is to create emotional utility for consumers (Best, 2010; Khan & Mohsin, 2017; Verbeke, 2005). Here, the industry can look to high-tech innovation when considering ways to secure income gains from innovation that remain in the wine industry and are not quickly passed on to wine consumers or to other industries.

Marketing can create strong position barriers, helping create and protect profits from entrepreneurial acts, but (upstream) technical capabilities may constrain thus hampering the effectiveness of an EO under imitability conditions (García-Villaverde et al., 2013). Business ecosystems, spanning the boundaries within and across industry players, serve as accelerators for industry-wide innovation (Al-Ali & Teece, 2013). One promising approach to innovation in the wine business has been the application of regional development and destination governance concepts such as co-innovation competence (Doepfer, 2012) and joint innovation approaches (Fischer, 2011). These concepts are suitable for governing loose innovation networks in a geographically confined space, and both approaches are rooted in Porter’s (2000) concept of clusters as geographically grouped firms, institutions, research facilities, suppliers, and service providers. There is a strong positive correlation between collaborative research on one hand and innovation performance on the other, but potential drawbacks of cooperation are knowledge disclosure, risks of disloyal partner behaviour, and the cost of coordination and monitoring within a network (Hottenrot and Lopes-Bento, 2016). This is why the influence of knowledge networks represents a complex phenomenon, where a multitude of factors influence the wineries’ ability to use the network as a development tool (Hojman, 2015). Only firms with resources and the capability to follow through on innovation were able to capitalise on knowledge-sharing opportunities (Taplin, 2012). “Technological leaders” foster the dissemination of innovation-related knowledge to other firms as a contribution to the development of the wine industry. Benchmarking and transparency on innovativeness serve as levers to foster innovation diffusion (Goldsmith, 2000; Schuhmacher et al., 2018; Vrontis et al., 2016; Wood & Hoefler, 2013).

The theory of resource dependency offers explanatory value to assess limitations in access to resources and capacity restrictions (Forrsman, 2011; Terziakowski, 2010) for small enterprises (Calabrese & Rubera, 2012; Carter, 1990; García-Villaverde et al., 2013; Roy & Sivakumar, 2010; Singer & Donoso, 2008; Teece, 2007). A parallel pursuit of product and process innovation seems to be a stretch in light of capacity restrictions of small firms (Harmsen et al., 2000). Indeed, whether firm size nurtures or hampers innovativeness is still a matter of debate (Freel, 2005; Harrison, 1994; Mazarol & Reboud, 2008; Stoeberl et al., 1998). In the German wine industry, even small players aim to strongly innovate, eventually ignoring a lack of innovation capacity (Dressler, 2016). Bandwagoning explains innovation as a result of imitation (Abrahamson, 1991, 1996; Giuliani et al., 2017) but also brings into question the value-creation potential of such innovation strategy.

Innovativeness and the effects of innovation represent an ongoing challenge in practice with further need for research and insights (Giuliani et al., 2017; Granata et al., 2019; Le Roy et al., 2018; Lubell et al., 2011; Moore & Benbasat, 1991). The proclaimed far reaching transformation in the wine industry from a product to a customer-centric business model (Dressler & Paunović, 2019, 2020; Sancho-Hernández et al., 2010) requires a systemic innovation in order to increase innovation capacity (Jørgensen & Ulhøi, 2010) and further exploration of innovation and innovators (F. A. Garcia et al., 2012; R. Garcia & Calabrente, 2002).

The global wine industry is mature and has a longstanding tradition, especially in the “old wine world” with historical production (e.g. Spain, France, Italy, Germany) but ongoing structural changes (Corsi et al., 2011; Gilinsky et al., 2014; Loose & Pabst, 2018; Remaud & Couderc, 2006; Storchmann, 2012). Global supply and competition, changes in consumer behaviour and preferences, and international markets with individually- and culturally-influenced consumption behavior characterize the global wine industry (Anderson & Nelgen, 2009; Gilinsky et al., 2014; Müller & Bürgelt, 2006; Santini et al., 2014; Schrader, 2008; Thomas et al., 2015). In the last 30 years, the number of German wine growers has massively declined by more than 50 percent, but the industry still shows a high degree of fragmentation (Anonymous, 2018; BMEL, 2016, 2019, 2021; BMELV, 2011; Datamonitor, 2010; Hoffman, 2015; Lambeck, 2015; Minnici & Merlin, 2016; Oberhofer, 2011; Scheuremann, 2012; Statistisches Bundesamt, 2010). The industry is characterized by small and medium players with an average revenue of less than one million Euros annually (Dressler, 2018). Although small in size, the wineries are predominantly highly integrated - from growing to harvesting to producing to sales and marketing.
Wineries hence need managerial competence for all value chain steps, and also to cope with the need for change and business model adaptation (BMEL, 2019). The integrated value chain coverage of the majority of the wineries results in the need for firms to develop competencies for multiple markets and this in turn impacts winery’s innovation behaviour. Additionally, the wine business belongs in the agricultural sector, with its strong dependency on nature (Ashenfelter & Storchmann, 2010b; Malheiro et al., 2012; Mozell & Thach, 2014). Wine is part of the food and beverages market, with multiple sales channels as well as the strong relative market power of the distribution side (Benson-Rea et al., 2003; Hanf et al., 2009; Haucap et al., 2013; Somogyi, 2013). Given the products’ high emotional utility, wine also shows characteristics of luxury products (Beverland, 2004, 2005; Hata, 2008; Higgins & Wolf, 2016; Hofman, 2015; Kim et al., 2016; Rodrigues & Rodrigues, 2019; Thode & Maskulka, 1996). As a result, the characteristics of asset-focused as well as consumer-driven markets with high emotional value and complexity of the product need to be considered in the wine context (Orth et al., 2007). Satisfying the needs of the different worlds, the product complexity as well as the need to deal with the transition of the market as described and the underlying changes of consumers stretches the entrepreneurs and might require technical as well as marketing innovation competence (Dell’Era & Bellini, 2009; Granata et al., 2019).

Germany is one of the largest wine consumer markets in the world (Anderson & Nelgen, 2009; OIV, 2011, 2016, 2021). Consumers in Germany annually drink around 2 billion litres of wine, or around 25 litres per capita (BMEL, 2017; DWI, 2020, 2021). Germany is also one of the world’s largest wine producers, importing annually almost 15 billion litres of wine (DWI, 2021). International trade and consumer interest in foreign products is a driver for innovation with the import of global new products and practices (Schipperges, 2013; Storchmann, 2018; Tröltzsch, 2009). The German wine market is characterised by strong competition on the supplier and declining brand loyalty on the demand side. Suppliers use innovation and strategic shifts (e.g. multi-channel sales or wine & tourism) to win new clients (Dressler, 2017b). Innovation touches the different areas or functional activities of wineries, encompassing technological innovations, service innovations, and business model innovations (Rantalainen et al., 2018).

As German wineries are highly integrated, the innovation portfolio potentially affects all steps in the value chain, from harvesting to sales and marketing (Dressler, 2013). Despite a widely acknowledged need to leverage innovation in strategic positioning, restructuring, and change management, there is a reluctance for business model innovation (Dressler, 2020; Pang et al., 2019). Historically, different kinds of innovation have shaped German viticulture, but the most important one has been the mechanisation of viticulture processes (e.g. harvester; overline tractor, trellis education), which has reduced the working hours needed per hectare by 90%, increasing productivity substantially (Oberhofer, 2012). Identifying new potential fields of innovation is important for the modern German wine industry, for wine suppliers, and also for the wider territorial development through co-innovation with other actors.

Given German wineries’ entrepreneurial nature and small size, it is necessary to acknowledge resource limitations (Barney, 2001). In the wine industry, tangible and intangible assets such as vineyard and terroir are of paramount importance (Bogonos et al., 2016; Deconinck & Swinnen, 2013; Van Leeuwen & Seguin, 2006). Wine is a natural product that is highly impacted by the soil and the location of the vineyard (Aschenfleiter & Storchmann, 2001). Extreme temperature, hail, or other weather have a strong impact on the product and the harvest (Aschenfleiter & Storchmann, 2010a, 2010b).

Securing attractive vineyards is therefore a financial and also a managerial challenge. In densely populated Germany an increasing land grabbing of different crops, ecologically-friendly agriculture (requiring more surface for farming), transportation or energy production, prices for land are on the rise (Bunkus & Thesfeld, 2018; Herre, 2013; Steinhäußer et al., 2015). Prime vineyards are rarely on the market since they are inherited over generations (Braatz et al., 2007; Rainer et al., 2019; Widder, 2016). Furthermore, the planting of vines is regulated and restricted resulting in increased scarcity of the resource (Bogonos et al., 2016; Deconinck & Swinnen, 2014; Meloni & Swinnen, 2016). Limited and costly access to vineyards hence present a financial strain and limitation. Implementing innovation often requires investments (e.g. new and more efficient bottling line). A broad innovation portfolio and simultaneous innovation in all value-chain steps increases the drain (e.g. terroir wines require the best and most costly soil and vineyard (plant); reinvest for fuel-efficient tractors (grow); steep-hill harvester (harvest); heat-regulated barrel fermentation (produce); Customer Relationship Management (CRM) or vineyard management software (organize); newly built wine cellars or fashionable sales rooms to gain attention (sales); access to sales representatives for export markets to profit from growth opportunities (sales). Wineries hence entrepreneurially try to gain and defend positioning and profiling based on resource access (Conner, 1991; Galati et al., 2014; García-Cortijo et al., 2021; Newton et al., 2015).

Resource dependency should accordingly guide strategic innovation management (Begalli et al., 2009; Touzard, 2010). Resource dependency theory fits situations where human and social capital are part of the coordinated resources to realize innovation (Jensen & Jorgensen, 2004), as is the case in the German wine industry (Giacomarra et al., 2019). From a practical point of view, awareness of resource limitations and dependency should serve to avoid “bandwaggoning” innovations, where the impetus is not solution driven but an anxiety to miss on opportunities (Abrahamson, 1996, 2000). Indeed, entrepreneurs need to steer their innovation efforts based on strategic fit, effectiveness in regards to operational results, and competitive leverage. In order to do so, there is an urgent need to better understand wineries’ portfolio of innovations, that is, the level of innovativeness, but also the value of the different innovations; hence, value measurement becomes key (Moore & Benbasat, 1991).
Innovation Management in Wine Business – Need to Address Front-End, Back-End, or Both?

3. RESEARCH QUESTIONS AND DESIGN

In order to provide sorely needed insights about the innovation management in small wineries, a multi-case study assessed the innovation activities of four German wineries. The research intended to explore the following questions: What is the individual perception of innovation in the wine industry (case-specific definition)? How are innovations viewed across wineries and what is the common understanding of innovativeness (innovation landscape)? What are the characteristics of the innovation portfolios of individual wineries (innovation profiles)? Does capacity or resource constraints limit the innovation portfolio and therefore require a decision to either focus on front- or back-end innovation (capacity-driven focus)?

The analysis assessed innovation across all steps of the value-creation in wine, from planting (back-end) to production to marketing (front-end). Front-end value creation was determined by possible direct interaction with the clients including the downstream value-creation steps of marketing, delivering and after-sales customer service. Upstream (back-end) value-creation steps were defined by closeness to viti- and viniculture and subsumed planting, growing, harvesting, producing and organizing. This approach served to split the innovation portfolio in viticultural- (back-end) or customer-centric (front-end) innovation areas.

Case research methodology collects in-depth information since few objects are assessed in detail and through a combination data from interviews, visits, and secondary sources (Eisenhardt, 1989; Gilmore & Carson, 2000; Hill & Wright, 2001; Simba & Ojong, 2017; Yin, 2008). The step-wise case analysis approach initially consisted of a discussion of each winery’s innovative activities. Then, the innovativeness of the mentioned activities was discussed. Subsequently, the interviewees were asked to state other innovations in the industry. The first examination was realized in each winery in the course of November 2019 until January 2020. In April 2020, winery CEO’s were invited to a group discussion on innovation in German wineries. The goal at this stage was to draw a jointly supported map of innovation in the German wine industry at each step of the value-chain and prioritizing the degree to which the innovation is exploratory. Such an approach to innovativeness reflects the status of diffusion: innovation with low exploratory degree shows high adoption of peers’ practices and is thereby rated to be less innovative whereas high exploratory innovation means lower diffusion of innovations in the industry. This innovation landscape was then challenged by experts of different wine research institutions in summer 2020. After the 2020 harvest ended, all CEOs were visited again to discuss whether they agree with the innovation landscape and the identified innovation portfolio.

Access to four German wineries allowed for multiple extensive interviews with the wineries’ CEOs. The interviews were complemented by several visits to all the wineries. Open interviews on innovation in the wine industry and each winery were complemented with assessing descriptive information (basic company data like size and ownership), strategic orientation (e.g. philosophy) and innovation perception. The data was validated using secondary data from external sources (i.e. statistical data, information in wine guides).

The first winery consisted of a cooperatively organized winery (C1 coop) in the Württemberg region. It represented the largest winery in the sample and its business model represents a cooperative with almost 100 producing vintners and joint annual production of about nine million litres of wine. Case 2 is based on a small, entrepreneurial (SE) winery in the Rheingau wine region under the control and management of the fifth family generation (C2 SMALL). This entrepreneurial winery grew from a mere 4 hectares to more than 10 hectares in the last 15 years. Case 3 is focused on a state-owned winery, which predominantly serves as a research facility but also needs to sell wine produced from more than 20 hectares directly to consumers (C3 STATE). Case 4 is a premium wine estate in southern Palatinate, celebrating its centenary birthday (C4 PREM). The winery produces using a low-yield strategy on about 20 hectares of family-owned vineyards.

The wineries in each case differ in size, ownership structure, and philosophy. Case 2 SMALL represents a “one-man show” with just one employee and production volume of about 100,000 bottles. Case 4 PREM employs seven employees and produces slightly more wine (about 110,000 bottles). Case 3 STATE employs more than 10 employees and produces around 150,000 bottles and case 4 COOP represents a medium-sized company with more than 70 employees and about 10 million wine bottles produced annually (0.75 liters/bottle).

Exploiting CEOs’ views on innovations and winery visits to validate the interview information are the core of the analysis. Benchmarking is done on the basis of an innovation grid mapping the most important innovations in the wine industry in the previous decades structured on eight innovation categories based on the value-chain steps of wineries with approximately 80 separate innovation activities. This approach allows for patterns of innovation to emerge from the data, and these patterns, when compared to the four companies’ basic data and the views of their CEOs on innovation, yield a picture of innovation in the four selected German wineries.

For each case study, at least two meetings with the CEOs and winery visits served to retrieve the data. The interviews were written down and then transcribed by MaxQDA. Excel served for descriptive statistics. In light of a limited sample and the explorative nature of the study, the emphasis of this study was on the descriptive analysis of wineries’ innovative activities.

4. RESULTS

The assessment of innovation activities of the cases resulted in a list of unstructured innovation activities which are listed on Table 2.

Innovation in German wineries is about introducing new things, but also about being creative and ahead of one’s time. Innovation is a wide-ranging topic, and the analysed wineries accentuated a different range of priorities regarding innovation. Nevertheless, a word occurrence analysis for “top mentioned innovations” across the case studies indicates some commonalities: “labels” were mentioned nine
Table 1. Overview of Case Studies

<table>
<thead>
<tr>
<th></th>
<th>CASE 1: COOP</th>
<th>CASE 2: SMALL</th>
<th>CASE 3: STATE</th>
<th>CASE 4: PREM</th>
</tr>
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<tbody>
<tr>
<td>Philosophy</td>
<td>Professional and customer-centric wine cooperative</td>
<td>Provision of enjoyment, emotion, passion</td>
<td>Creating winning wines and a turf for research and training</td>
<td>Outstanding, individual wines on organic viticulture, quality, terroir</td>
</tr>
<tr>
<td>Employees</td>
<td>72</td>
<td>1</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Size (approx.)</td>
<td>866 ha</td>
<td>14 ha</td>
<td>22 ha</td>
<td>20 ha</td>
</tr>
<tr>
<td>Production (bottles)</td>
<td>9 to 12 million</td>
<td>105,000</td>
<td>150,000</td>
<td>110,000</td>
</tr>
<tr>
<td>Yield</td>
<td>85 hl/ha</td>
<td>65 hl/ha</td>
<td>70 hl/ha</td>
<td>55 hl/ha</td>
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Table 2. Innovations Mentioned by German Wineries

<table>
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<tr>
<th>C1 COOP</th>
<th>Innovations by Each Winery</th>
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<tr>
<td></td>
<td>• High-end screw caps&lt;br&gt;• Bordeaux bottles&lt;br&gt;• Two-part / three-part labels&lt;br&gt;• Modern labelling&lt;br&gt;• Switching from mash heating to mash fermentation&lt;br&gt;• Fermenting a large share of wines in oak barrels&lt;br&gt;• Developing cuvées specifically targeted at a younger population from production process to branding&lt;br&gt;• Use of Customer Relationship Management (CRM) software</td>
</tr>
<tr>
<td>C2 SMALL</td>
<td>• New visual appearance / corporate design&lt;br&gt;• Continuing differentiation strategy with the help of CRM software that has an integrated balanced scorecard and deals with both qualitative and quantitative data on customers</td>
</tr>
<tr>
<td>C3 STATE</td>
<td>• Spontaneous fermentation of cuvées in oak barrels&lt;br&gt;• Fermenting Sauvignon Blanc and new red wine varieties in oak barrels&lt;br&gt;• Vegan wine production&lt;br&gt;• Micro oxidation of Pinot Noir for a rounder wine taste&lt;br&gt;• Mash fermentation&lt;br&gt;• Separation of cuvées by varieties&lt;br&gt;• Self-positioning as an innovative, research-oriented wine estate&lt;br&gt;• New CRM software</td>
</tr>
<tr>
<td>C4 PREM</td>
<td>• Establishment of company successors, new generations introducing innovations&lt;br&gt;• Employing young people from the same age cohort as sommeliers and customers&lt;br&gt;• IT&lt;br&gt;• Labels&lt;br&gt;• New wines classification&lt;br&gt;• Warehouse expansion&lt;br&gt;• Price list innovations</td>
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times, "oak barrels" seven times, "fermentation" and "screw caps" six times each, and "harvesting" and "bottling" four times each. Wine packaging-related innovations ("labels", "screw caps", "bottles") and wine production-related innovations ("oak barrel", "fermentation", "harvesting") are on the mind of German wine producers. The domination of product-related innovation illustrates a lag of a proclaimed industry transition to customer centricity (Sánchez-Hernández et al., 2010) whereas indications for product-centrism is repeatedly identified (Dressler, 2013, 2017a; Wilson, 2008; Wilson & Lockshin, 2003). The word count speaks for a domination of customer-centric innovation focus across the searched wineries. The iterative structuring of winery-specific and general innovation activities alongside the defined value-creation steps resulted in a map shown on Table 3 that was later used to assess each winery’s innovation portfolio and compare it with the other cases.

The CEOs jointly agree that cold fermentation belongs to the important innovations in the German wine industry. Other important innovations concern safety, cleanliness, and sustainability: reaching new standards in wine cellar design and processes (e.g. management of oxygen, gentler grape-harvesting machinery with destemming, reinforced stainless steel equipment, implementation of a holistic, low-consumption and eco-friendly energy concept).

Innovation activity and eventual focus of the wineries was assessed calculating the wineries’ innovations over all the mentioned innovation activities. Table 4 shows that no winery stated to have implemented all innovation actions that the group identified. The CEOs mentioned innovations with low or no diffusion. C1 COOP though marked highest innovation activity in every value-chain activity. The strong resource base and availability of resources for new investments give it a competitive advantage compared to smaller wineries. In light of the size of this winery, compared to the benchmarking partners, the business model speaks for a lower resource dependency. Indeed, the cooperative business model has size advantage, economies of scale effects, and economies of scope since the organization can draw on different capabilities (Biao, 2017; Lee & Mulford, 1990;
### Table 3. German Wine Industry Innovation Landscape

<table>
<thead>
<tr>
<th>Explorative degree</th>
<th>(1) PLANT</th>
<th>(2) GROW</th>
<th>(3) HARVEST</th>
<th>(4) PRODUCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>top</strong></td>
<td>Minimal pruning</td>
<td>Wine scout</td>
<td>Optical sorting machine</td>
<td>Blue wine</td>
</tr>
<tr>
<td></td>
<td>Own seedlings</td>
<td>Caterpillar for steep sides</td>
<td>Harvesting machine with destemmer</td>
<td>iFerm App</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overlapping caterpillar</td>
<td>Harvesting machine for steep sides</td>
<td>Integrated pump-over machines</td>
</tr>
<tr>
<td><strong>high</strong></td>
<td>Mushroom-resistant varieties</td>
<td>Tunnelling trailer with sprayer</td>
<td>Swing destemmer</td>
<td>Wine scan, Grape scan</td>
</tr>
<tr>
<td></td>
<td>Irrigation with integrated fertiliser</td>
<td>Vine wood extractor</td>
<td>Night harvest</td>
<td>RFID based density test</td>
</tr>
<tr>
<td></td>
<td>New varieties/Cloned varieties</td>
<td>Air fan</td>
<td>Modern press (with press program choice)</td>
<td>Fermentation assistant (software)</td>
</tr>
<tr>
<td></td>
<td>Trellis education</td>
<td>Antidrift injectors</td>
<td>Gentle grape transport discharge with vibration</td>
<td>Tannin inject</td>
</tr>
<tr>
<td></td>
<td>Irrigation</td>
<td>Greening</td>
<td>Enzyme</td>
<td>Cold maceration</td>
</tr>
<tr>
<td></td>
<td>Extended row width</td>
<td>Leaf-cutter</td>
<td>Harvester</td>
<td>Barrels with cooling</td>
</tr>
<tr>
<td></td>
<td>Trellis education</td>
<td>Rotating harrow</td>
<td>Soft press activities</td>
<td>White wine in wooden barrels</td>
</tr>
<tr>
<td><strong>standard</strong></td>
<td>Extended rows length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Big headland</td>
<td>Hollow cone</td>
<td>Pump-over chips</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compact clones</td>
<td>Wooden barrels</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>low</strong></td>
<td>Mulcher</td>
<td>Hand mashing</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Explorative degree</th>
<th>(5) ORGANIZE</th>
<th>(6) MARKET</th>
<th>(7) DELIVER</th>
<th>(8) CARE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>top</strong></td>
<td>Prosuming</td>
<td>WEB 2.0 (Blog)</td>
<td>Portioned wine (glass/small bottle)</td>
<td>Product reviews</td>
</tr>
<tr>
<td></td>
<td>Crowdfunding</td>
<td>Twitter</td>
<td>Outsourcing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patent/Licensing</td>
<td>Instagram</td>
<td>Integrated RFID</td>
<td>Treasure vault/Wine bank</td>
</tr>
<tr>
<td><strong>high</strong></td>
<td>Outsourcing</td>
<td>Restaurant</td>
<td>Light glass bottle</td>
<td>Wine Club</td>
</tr>
<tr>
<td></td>
<td>Bar</td>
<td>Green wine box</td>
<td>CRM exploitation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facebook</td>
<td>VinoLok</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Partnerships</td>
<td>Online shop</td>
<td>Bag-in-box</td>
<td>Web pictures, videos</td>
</tr>
<tr>
<td></td>
<td>Sustainable company management</td>
<td>Winery events</td>
<td>Twister</td>
<td>Wine route</td>
</tr>
<tr>
<td></td>
<td>Solar cells</td>
<td>Modern architecture</td>
<td>Label/sleeves remover</td>
<td>Trial packages</td>
</tr>
<tr>
<td></td>
<td>Photovoltaic</td>
<td>Joint venture marketing</td>
<td>Reusable bottles system</td>
<td>Sponsoring barrel production</td>
</tr>
<tr>
<td></td>
<td>Modern wine club</td>
<td>Delivery tracking system</td>
<td>Sponsoring vine stock</td>
<td></td>
</tr>
</tbody>
</table>
Table 4. Innovation Assessment

<table>
<thead>
<tr>
<th>Innovation Achievement</th>
<th>1 Plant</th>
<th>2 Grow</th>
<th>3 Harvest</th>
<th>4 Produce</th>
<th>5 Organize</th>
<th>6 Market</th>
<th>7 Deliver</th>
<th>8 Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl COOP</td>
<td>92%</td>
<td>94%</td>
<td>67%</td>
<td>80%</td>
<td>92%</td>
<td>76%</td>
<td>47%</td>
<td>57%</td>
</tr>
<tr>
<td>C2 SMALL</td>
<td>42%</td>
<td>47%</td>
<td>67%</td>
<td>45%</td>
<td>69%</td>
<td>53%</td>
<td>35%</td>
<td>50%</td>
</tr>
<tr>
<td>C3 STATE</td>
<td>83%</td>
<td>59%</td>
<td>50%</td>
<td>45%</td>
<td>31%</td>
<td>41%</td>
<td>41%</td>
<td>43%</td>
</tr>
<tr>
<td>C4 PREM</td>
<td>75%</td>
<td>59%</td>
<td>58%</td>
<td>55%</td>
<td>77%</td>
<td>71%</td>
<td>24%</td>
<td>50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovation Benchmark</th>
<th>Max</th>
<th>Cl COOP</th>
<th>C2 SMALL</th>
<th>C3 STATE</th>
<th>C4 PREM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl COOP</td>
<td>92%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>C2 SMALL</td>
<td>45%</td>
<td>50%</td>
<td>100%</td>
<td>56%</td>
<td>75%</td>
</tr>
<tr>
<td>C3 STATE</td>
<td>91%</td>
<td>63%</td>
<td>75%</td>
<td>56%</td>
<td>33%</td>
</tr>
<tr>
<td>C4 PREM</td>
<td>82%</td>
<td>63%</td>
<td>88%</td>
<td>69%</td>
<td>83%</td>
</tr>
</tbody>
</table>

Palmer, 2002; Zuckerman & D’Aunno, 1990). The principles of cooperation and joint decision making has a positive effect on the innovation portfolio, front- and back-end (Biao, 2017; Chang et al., 2012; Giacomarra et al., 2019).

A calculation with Cl COOP as the benchmark (Cl COOP score set as maximum score), served to highlight followers and eventual laggards in the different value chain activities. As shown on Table 4, C3 STATE clearly undervalues organizational innovation. The interviews and secondary analysis revealed that the state-owned winery’s investment decisions were more easily approved when asking for technological investments. Organizational improvement or innovation to allow for more attractive marketing is much more difficult to get approval for. As a result of a higher degree of bureaucratisation and foremost dependency on the owning party and the limited access to resources, this winery scored significantly lower in the marketing innovation category, where it has experienced problems running Blogs, using Twitter or Instagram, and expanding into tourism, restaurants and bars, paid wine tastings, and organised events.

C2 SMALL meets the benchmark for harvest innovation activities. Indeed, the winery owner self-identified as a technophile. Furthermore, a lack of employees and supportive help steer his innovation activities towards securing the most efficient harvest processes (Berends et al., 2014; Servantie & Rispal, 2018). A strong innovative focus on delivery also finds explanation in a personal preference of these processes by the winery owner. He has been awarded for the creation of a customer relationship management (CRM) tool, surely motivated by his prior career as a management consultant and the fact that he strongly emphasizes after-purchase customer-care activities – again, securing efficiency. Case 2 showed some deficiencies regarding awards, or certifications. The entrepreneurial attitude resulted in limited boundary spanning which is unfortunate since it could have served to lower resource dependency and help the firm excel beyond the scope of the technophile owner’s plans.

The premium winery, C4 PREM, puts an emphasis on organizational innovation. Organizing is a means to ensure highly professional processes. Relying strongly on tradition but with a high degree of organization characterize the innovation path that fits C4 PREM’s business model. Less emphasis on innovation for the value-chain stage of “delivery” finds explanation as this winery business model strongly profits of direct-to-consumer sales and a loyal customer base. Part of the winery’s value proposition is being “high
Innovation Management in Wine Business – Need to Address Front-End, Back-End, or Both?

Table 5. Innovation Focus

<table>
<thead>
<tr>
<th></th>
<th>Back-End</th>
<th>Front-End</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 COOP</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>C2 SMALL</td>
<td>65%</td>
<td>77%</td>
</tr>
<tr>
<td>C3 STATE</td>
<td>64%</td>
<td>72%</td>
</tr>
<tr>
<td>C4 PREM</td>
<td>77%</td>
<td>77%</td>
</tr>
</tbody>
</table>

The need for practitioners to address and synchronize front- and back-end innovation can be best addressed by industry executives through fitting the innovation strategy to their firm’s business model and by overcoming resource dependency through cooperation and exchange. Entrepreneurial innovation management and knowledge exchange help wineries prevent bandwagoning innovation from innovation diffusion.

This study suffers several limitations. An analysis of four cases cannot be representative of the entire German wine industry and therefore this study only has explorative value. Benchmarking wineries’ innovation activities is influenced by subjective perceptions of innovativeness. Technological advances shorten the life-cycle of innovative measures. An measure of innovative performance can quickly become an industry standard. Benchmarking therefore requires permanent update with technological advances. The chosen cases represent a diverse range of business models and therefore the presented results have a bias of differing innovation profiles. Furthermore, country effects need to be acknowledged. The results suggest the need for future research to (a) improve upon the used innovation grid in the light of future technological developments, (b) adapt the grid for country-specific factors, (c) simulate results using different innovation coefficients, and (d) enrich the analyses through additional case analyses.

6. CONCLUSION

Innovation is deemed to be a key success factor for wineries operating in increasingly competitive markets. Demands for executives to successfully management their firm’s innovation processes is high, considering increasing complexity, financial burdens, shorter product life cycles, and digitalization in the wine industry. Executives of small- and medium-sized enterprises with limited resources face a particularly strong need to wisely manage innovation in their firms. In order to provide an assessment of innovation management in SME wineries, a multi-case study was conducted. The case analysis reveals that resource dependency can best be overcome when profiting from firm size effects and access to cooperative resources. The innovation activities of four German wineries at each step of the value chain was subject to analysis. The observed innovation strategies are in turn explained by the business models and entrepreneurial characteristics of the wineries studied. A closer fit between a winery’s business model and its innovation strategy as well as industry-level joint activities can serve to increase wineries’ overall innovativeness.

The four cases analysed demonstrate that a) innovation matters, b) strategic positioning influences the innovation portfolio, c) size and organization impact the innovation portfolio, d) resource dependency offers explanation and thereby cooperative action allow to overcome barriers and e) smaller producers must play on their entrepreneurial personality. All integrated wine producers need to address front- and back-end innovation, but carefully observing their winery’s innovation accentuation and individual innovation portfolios. The wineries also need to recognize the synergetic value of the two different focal points: convincing products require optimal planting and farming whereas the product assortment and its treatment should consider customer profiles. Hence, front- and back-end innovations need to be synchronized and considered in parallel, without ignoring the individualization of the firm’s innovation portfolio. A synergetic innovation approach, exploiting technology and data mining, can foster the development of wineries’ competencies through the use of existing wine industry resources and capabilities. Knowledge exchange helps producers reach consensus on innovation activities, goals, and strategies, and to improve the business ecosystem by identifying elements that are obsolete or ripe for change. Diffusion of innovation will be secured when those conditions are met.
References


