Business Plan of a Winery of Artisanal Wine Production

João Miguel dos Santos Pinto

Paper to obtain the Master of Science Degree in Industrial Engineering and Management

Instituto Superior Técnico

Abstract - With the entry into the new millennium, a golden age began, where physical barriers lost importance regarding the movement of goods, services and capital, allowing a decentralization of the economical world, allocating companies around the world to generate more employment, thereby increasing purchasing power, strengthening the economy. The set of these conditions allows the creation of a stable and reliable platform for entrepreneurs to originate new businesses. This scientific article approach to the creation of Natwine, a business that focus of an artisanal wine production winery, which is a product with a big growing market trend, specially on the elaboration of a decisive document about the planning and decision making, widely used on new businesses area: business plan. The long productive processes and project variables are of priority character to business analysis using a simulation software application, the Simul8, to evaluate the equipment buying, time management and resources optimization, to avoid risks as over and under project sizing. The winery focus the production on three distinct areas: Red (RTW, DGRTW), White (DBW) e Fortified (MSW e MRW) wines, with different processing times between them, ranging from 6-7 months to 6 years of production, being necessary a big financial flexibility to support all the costs, while the product is not launch to market. In economic terms, this business presents the total investment coverage on the third production year (with annual production growing conditions of 10%), with a Cash-Flow increasing 36 times higher from the first to the seventh year of production, revelling the strong viability and sustainability for the involved stakeholders.

Keywords: Artisanal Winery; Winemaking; Operations Simulation; Business Plan; Material flows; Viability.

1 Introduction

In the current days, the immersion in the business market in the current days is increasingly complex, either by the strong competitiveness, difficult differentiation of products or even the difficulty in creation of efficient and adaptable structures to the constant changes in the global economic fabric.

A business plan was devised for the design of an artisanal wine production, analyzing and evaluating the sizing of the necessary resources, potential risks of under and over dimensioning (focusing on the production process), and the generation and maintenance of stable bases for the transposition of the idealization to the practical conception, as well as the systemic and procedural introduction for all involved stakeholders, with support of the fundamental principles of the Business Plan: the People, the Opportunity, the Context, the Risk and the Reward.

The main objective of this dissertation is the elaboration of a business plan using methodologies of simulation as a basis, to make the result as real as possible, bringing to stakeholder an already optimized / improved system, whose gains from the operational process are well known, even before the transition from the virtual to the real. The main points of the scientific article are: research and analysis of the wine market, including collection of (statistical) data, production methodology, and market research; development of a simulation model of the production process of three different wines typologies (Red, White and Liquor); construction of a structured business plan based on the simulation model; study the feasibility of the project, evaluating the capacity of potential success with the wine market and investors.

2 Literature Review

Wine is defined as an alcoholic beverage fruit of the fermentation of grapes (Oxford Dictionary), and it can be divided in three categories: table wine (that includes Red, White and Rose Wine), sparkling wine

(traditional and Charmat) and fortified wine (wine with big alcoholic concentration, example: Vinho do Porto or Moscatel). The wine production is divide is 11 main activities, all essential to make the perfect final product: harvest of grape arrival, destemming, grape crush, maceration, fermentation, malolactic fermentation, maturation, finishing/ stabilization, bottling and aging (Jackson, 2008).
Entrepreneurship is defined as the discovery, evaluation and exploration of new opportunities, being a strong influence to the evolution of the economic market by allowing the creation of new businesses and to create jobs, wealth and innovation. The business plan comes to give support to the entrepreneur in terms of business structuration, analysis and evaluation of scenarios, but most importantly to attract investment and demand, satisfying all the involved stakeholders (Harrisson e Mason, 1996). It is structured in 8 phases based on McKinsey&Company: Executive Summary, Product/ Service, Management Team, Competition and Market, Marketing and Sales, Business organization and system/ Timing, Financial Plan and Risk/ Opportunity analysis.
From operational point of view, a business plan and the processes sizing are strictly related, on the one hand to achieve effectiveness and efficiency inherent of the processes, and on the other hand to satisfy the needs of customers in an efficient way. There is risk associated to this, as the over and under sizing, being necessary the implementation of methods capable of overcome the difficulties. The process simulation comes to fill this, studying different scenarios and reach an optimized one (Banks et al, 2014), being full vantages, like allowing the analysis of new operating procedures, information chains, definition of new policies without detracting from the real system, the testing of new hardware designs, physical layouts, without compromise and invest in test products; hypotheses of a certain event occurring can be easily tested and also assists the recognition of bottlenecks in the flow of operations, but by other side there are some disadvantages like the construction of the model requiring specialized training, the simulation results can be difficult to understand and the quality of the inputs can interfere in the quality of the outputs, affecting the simulation, even if the proposed model has been well constructed. One of the most efficient software's do it, it the Simul8, combining a visual simulation, allowing the test of discrete and continuous models, report generating, standing out of the most simulation software competitors (Domonkos, 2010).

3 Natwine Business Plan

3.1 Business Summary

The world wine market is characterized by three aspects: decrease in the area of vineyards, stagnation of consumption and increased sales and price (Wine Institute, 2019), are the demand and supply satisfied? No, consumers are looking for products than offer innovation, and the "new" have always been and will be key words in solving problems of this kind, but in this case the word reinvention is the most correct: artisanal wine. In other words the Natwine focus their effort in bringing something to the market, in area where competitors are scarce.

3.2 Products

The Natwine winery specializes only in regional products, in other words, the grape destined to the practice of the vinification comes from the region of Palmela, totally of biological origin. The products are divided into 5 different categories with different grapes, castes, produced quantities and bottles. This is represented by table 1.

Table 1 - Description of wine annual production, including liters quantity, castes and bottles used

Tipo de Vinho	Produção Anual (Litros de Vinho)	Uvas Necessárias [1] (Quilogramas)		Tipo de Garrafa [3] (Anual)	Total de Garrafas (Anual)
Regional Tinto Wine (RTW)	17 000	Castelão	17 000	330 mL	20 606
		T.N	7285,5	750 mL	13 500

DO Grande Reserva Tinto Wine (DGRTW)	7 000	Castelão	10000	750 mL	13 332
DO Branco Wine (DBW)	8 000	Arinto	5714	330 mL	9 695
		M.S	2400		
		F.N	1600	750 mL	6 400
Moscatel de Setúbal Wine (MSW)	11 000	M.S	10476[(2)]	500 mL	20 952
Moscatel Roxo Wine (MRW)	7 000	M.R	6666[(2)]	500 mL	13 332

3.3 Management Team

Natwine has three founding members with educational background in engineering, finance, and oenology:

1. The CEO is trained in industrial engineering and management, former production director of a winery industrial;
2. The CFO, graduated in Financial Sciences, has more than 20 years of experience working in the area of Banking and Consulting.
3. The CTO, is a student of Enology, but already with an oenology experience, passed through several wineries, both industrial and artisanal.

3.4 Market and Competition

According to TrendWatching (2014) there are three factors that define the population as consumers: taste for buying, desire for responsible consumption and trust for the brands that promote the interests of society. In terms of wine market there is excellent tendencies, mainly in national panorama and all which is related with health, environment and uniqueness. The below PESTEL analysis allows to identify the potential risks and opportunities of the market.

3.4.1 PESTEL Analysis

Political and Legal Factors

On one hand there is the recognition of organic wine statutes, which gives prominence to a product that possesses it, on the other hand the tight control measures of the European Union require the standardization of the additivation for conservative means, making the production processes more complex. On the other hand, it is important to highlight the aid policies in this style of production, in which there are two main tools: Greening Factor, which consists of direct payment to producers who make the link between environmental activities and their production and 30% of the budget of the Rural Development Program will have to be agro-environmental organizations that support organic agriculture or projects associated with environment.

Economic Factors

The progress of winery activities can be classified of the bellow concepts:

1) Unemployment rate - Portugal managed to achieve a drop in the unemployment rate, reaching 6.3% in 2019, representing very positive and motivating figures for national companies;
2) Average and minimum remuneration of the sector - Portugal has increased the average and minimum wage over the years, causing an increase in the price of products
3) Hourly labor cost – The winemaking business is not fully active through all the year, reducing the costs of human resources when they are not needed;
4) Raw Material Costs – The conventional wineries pay almost the double for the grapes, compared with the biological ones, due the governmental support policies.

Social Factors
It exists a potential tendency, due health awareness, to reduce alcohol consummation, however it is balanced by the opportunity created with recent propensity in the choice of eco-friendly products, biological and quality, drawing a vision of good spirit for artisanal wines.
It is also important to refer that unbalanced demographic rates can make it difficult to obtain work for rural areas.

Technological Factors
Biological wines are potentially sensitive for not using sulfites, reducing their shelf life, however there is a strong bet on methods that can replace sulfites, such as more effective filters or harmless barrels. Also, Nowadays, new methods of preservation of wines are investigated mainly by the universities in partnership with companies, namely the Instituto Superior de Agronomia or the Universidade do Porto in Portugal, allowing to improve the products that go out to the market.

Ecological Factors
The terms organic, organic, artisanal, sustainable are increasingly being used worldwide, and already categorize a way of living, that when related to the wines, consumers associate them to a fresh, tasty, authentic product that knew how to preserve the natural cycle of the systems involved, namely the production of grapes. Typically these products pesticide and fertilizer restrictions on primary production, use of genetically modified products (GMOs) and also limiting food additives such as sulfites or artificial thickeners.

3.5 Marketing and Sales

Mission
Natwine stands out to produce the best products with orientation of three basic principles: the quality, customer satisfaction and environmental protection.
Vision
Create the wine with the customer's taste

Natwine intends to focus on the implementation of a Pull Marketing strategy, to anticipate the needs and curiosities of the consumer before even launching a product for the market through direct contact with the client and a system of suggestions. The below TOWS matrix revels the main strengths, weakness, opportunities and threats, and potential strategies of Natwine Business (table 2)

Table 2 - TOWS Matrix of Natwine

		Internal Factors	
External Fators	TOWS Matrix	**Strengths** - Biological and sustainable product; - Innovative products (330 ml bottles); - Zero product image% plastic; - Reconciliation of the modern to the traditional process; - Management based on simulation models. - Reduced competition in the wine sector	**Weakness** - Instability of organic wines (validity) - Great investment in equipment and building; - Dependence on the quality of the raw material; - Long processing times;

	Opportunities - Strong trend towards sustainable products; - Availability to provide subsidies; - High rate of export of Portuguese wine; - Strong curiosity in the experience of new products (Millenials); - Low shelf life	Strategies SO Offer of new ranges of products; - Focus on the consumption of organic products trend;	Strategies WO - subsidize the initial investment of the winery; - Annual product growth; - Annual sales equivalent to the previous year's production;
	Threats - Reduction in demand for alcoholic beverages (health); - Very competitive market (industrial wine); - Ignorance about the type of product; - Population density unbalanced nationally; - Increase in average remuneration.	Strategies ST - Creation of a brand that focuses on communication and customer loyalty; - Reduction of alcoholic percentages compared to other market alternatives	Strategies WT Location closer to the literal zone; - Optimization of human resources and equipment in the winery;

3.6 Business organization and system/ Timing

After the arrival of the grape (exponential distribution with 17 hours on mean), the processing of the grape immediately begins, once the waiting for this raw material must be rationed to the maximum due to the perishability of the fruit. O flow is shown in figure 1 that represents the simulation flow of Simul8 also.

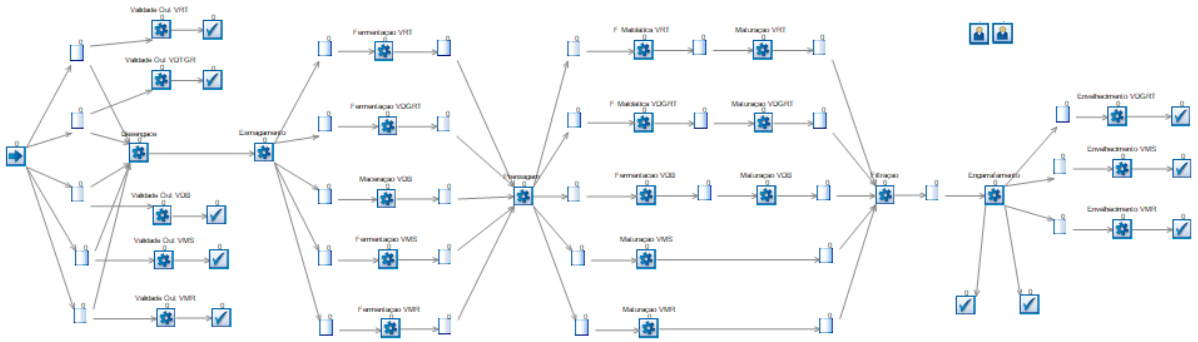

Figure 1 - Processing flow from grape to wine

Important information about the system simulation:

1. It was created a label that divides the work items (1, 2, 3, 4, 5) to respective work centers;
2. The base scenario only includes one equipment and one resource (when it applies) in which activity;
3. There is a shift on the simulation from 08:00 to 17:00, from Monday to Saturday that applies only to grape arrival and human resources.
4. Each arrival represents a batch, that's equal to 1000L/grape, that is equivalent to the work item.

Human Resources

The production of wine in the Natwine cellar implies the use of human resources. There are two types of resources operational functions with specific functions:

1. Winery Technician - Responsible for maintaining the flow of production. It applies in four processes: destemming, crushing, pressing, finishing / stabilization and bottling. Each operation requires the presence of one winery Technician.

2. Winemaker - The winemaker is responsible for maintaining the quality of the product. It is necessary and responsible for destemming process and finishing / stabilization to ensure the correct quality of the wine before bottling. It is only necessary the presence of one oenologist in each process

Equipment and activities

It is necessary to decide how many are important to perform the wine production on the optimal way. The bellow table presents each equipment's are designated to each activity and models to choose, according the simulation results.

Table 3 - Ativities and equipment of Natwine winery

Activity	Entity	Equipment	Distributions	Medição
Grape Arrival	Grape	-	Negative Exponential	17 h between arrivals
Destemming	Grape	Decanter	Fixed	0,71h / batch
				0,63 h/ batch
				0,44 h/ batch
Crushing	Grape	Crusher	Fixed	2,04 h/ batch
Maceration/ Fermentation RTW	Grape	Stone Tank	Average	168 h/ batch
Maceration/ Fermentation DGRTW	Grape	Stone Tank	Average	192 h/ batch
Fermentation DBW	Grape	Stainless Steel Tank	Average	168 h/ batch
Maceration DBW	Grape	Stainless Steel Tank	Average	24 h/ batch
Maceration and Fermentation + Alcoholic addition MSW	Grape	Stone Tank	Average	2880 h/ batch
Maceration and Fermentation + Alcoholic addition MRW	Grape	Stone Tank	Average	4320 h/ batch
Pressing	Grape	Press	Fixed	0,77 h/ batch
				0,5 h/ batch
				0,42 h/l batch
Malolactic Fermentation RTW	Grape	Barrel	Fixed	360 h/l batch
Malolactic Fermentation DGRTW	Grape	Barrel	Fixed	360 h/ batch
Maturation/ Clarification RTW	Grape	Barrel	Fixed	4320 h/ batch
Maturation/ Clarification DGRTW	Grape	Barrel	Fixed	8760 h/ batch
Maturation/ Clarification DBW	Grape	Barrel	Fixed	4320 h/ batch
Maturation/ Clarification MSW	Grape	Barrel	Fixed	17520 h/ batch
Maturation/ Clarification MRW	Grape	Barrel	Fixed	43200 h/ batch
finishing / stabilization	Grape	Filter	Fixed	2 h/ batch
				0,95 h/ batch
				0,84 h/ batch
Bottling	Grape	Filler	Fixed	2,67 h/ batch
				1,69 h/ batch
Aging DGRTW	Grape	Bottle	Fixed	8760 h/ batch
Aging MSW	Grape	Bottle	Fixed	4320 h/ batch
Aging MRW	Grape	Bottle	Fixed	4320 h/ batch

1st Section – From Arrival to Crushing

The first section includes one of the most critical phases: waiting for the entrance into the winery. This "wait" can never be longer than 24 hours, because grapes starts to lose quality after that period, being considered as unsuitable for the production of wine and considered scrap. With a reception rate of 17 hours per 1000 liters of grapes, it is necessary that the first process, destemming, is efficient enough to allow the reception of 50 thousand liters of grapes, without exceeding the period of validity. In this way, it was tested the three decanters in order to select the most advantageous in terms of the average waiting period of the grapes, since there is no advantage in the single decision and exclusively by a higher rate of processing versus cost. Taking as point of analysis the queue of the Regional Tinto Wine it was concluded that it does not justify the purchase of a decanter with a higher processing rate, dropping the choice to 2000 kg / h decanter, since the waiting time for the destemming never exceeds 24 hours, for example an average of 1.67 hours of waiting for the RTW, with similar values for the remaining grapes. Regarding the crushing, there are no alternative models, only the purchase of one or more equipment of the same model. On average one crusher processes 1000 liters of grapes in 2.04 hours, which takes almost 102 hours to process 50 thousand liters of grapes. The purchase of the second crusher makes possible the leveling the process flow between the processing rates (0.71 batch

/ h + 1.01 batch / h) and save at least 51 hours of work, which despite residual in the totality of wine production, are very important because of the sensitivity of the grape or wort in the pre-fermentation phase. It was decided to purchase two crushers.

2nd Section – Fermentation Phase

The second section includes the most important phase of all wine production, fermentation (except for the DBW, which is performed after the press), in which the alcohol will be formed. There are two decisions to be taken before the second section, considering the different variables such as different fermentation and pressing taxes (for the three equipment), which include the number of Stainless Steel Tanks (in the maceration of the DBW), number of stone tanks and the model of the vertical press to be acquired. After the simulation, the results obtained suggest the accomplishment of the activities of Simul8 in batch, except for DBW, in which the deposits used process a work item. In this way for the DGRTW, MSW and MRW, whose volume does not exceed the capacity of the stone tank, a lot is made with the total amount of wine to be made in the respective tank, while in the case of RTW the 17 thousand liters are divided into two production lots, each one in its tank (1 lot of 9 thousand liters and another of 8 thousand liters). Five tanks are required in total. Concerning DBW, two deposits of stainless steel are needed to avoid waiting times in the pre-maceration, since the white wine is very sensitive structurally. In these activities, except for the maceration of the DBW, it is performed the foot-by-foot technique without associated resource, given that it is not a continuous process and is carried out mainly by visitors (rural tourism) interested in enjoying this kind of experience. In relation to the press, the three models were tested and it was concluded that the press 2000 L/h is the most advantageous, because being an intermediate model that brings an average saving of 46% waiting time in the pre-press (compared to the press of 1500 L/h) and being cheaper than the press of 2400 L/h, which would only bring 16% less waiting time, not bringing a clear added value.

3rd Section – Maturation Phase

The third section includes the longest processes of wine production: the stages of maturation. But in any of the processes, including the maturation of the DBW, the use of single equipment in each one, being a barrel or stainless steel deposit, implies long waiting times to start each activity, being that the longer the activity, the longer the waiting time, since it would only be possible the processing of one work item per time. In order to maintain the quality of the wine, for each activity of the third section, the waiting time cannot exceed 3 hours, it is necessary that the processes are carried out in parallel. Based on this, it is concluded that the ideal combination is the use of 17 barrels in malolactic fermentation RTW and 17 in maturation, while in malolactic fermentation of DGRTW and DGRTW maturation, 7 barrels are required in each of the processes. Regarding the white wine, the optimal number of stainless steel tanks for fermentation are three, since it allows the stabilization of the waiting times between 0 and 3 hours, while in the DBW maturation, 8 barrels. For MSW and MRW maturation 11 and 7 barrels are required for each of the processes, respectively.

4th Section – From finalization to aging

The fourth section is the culmination of wine production. To ensure the quality of the wine all of the average waiting time in the pre-filtration cannot be exceed the 5 hours, as well as in the subsequent waiting queues. Given the choice of the equipment models, both filtration and bottling, the different options were tested, which it was concluded that it is impossible to reduce waiting times for the desired periods, even with extra processes in parallel. The problem at this stage was the inefficiency of the human resources to perform the work in these two devices, mainly the winery technician. Up to this point, there were no changes to the basic proposal of one human resource for each process, until finally discovering the limiting point of this decision, where it would be necessary another winery technician, which can reduce by 81% the waiting queues, entering on the desired patterns, most noticeably with a maximum of 2.5 hours of waiting for the MSW. With the introduction of the second winery technician the most beneficial combination at the equipment level is the use of the 1050 L/h filter and 375 L/h filler,

which despite not having the highest production rates, process enough to be inside of the standards, presenting as such lower costs.

Results of Simulation

The results of simulation are shown on table 4.

Table 4 - Processing time of each type of wine

Type of Wine	Minimum time	Average time	Maximum TIme	Standard Deviation
RTW	6,6 month	7,1 month	7,7 month	0,4 month
DGRTW	25,2 month	25,8 month	26,2 month	0,4 month
DBW	6,2 month	6,3 month	6,4 month	0,07 month
MSW	34,5 month	35 month	35,5 month	0,4 month
MRW	70,3 month	70,6 month	71,1 month	0,3 month

3.7 Financial Plan

The table 5 shows the results of the financial projection on 7-year term.

Year	0	1	2	3	4	5	6	7
Revenue		130252	260504	593497	916500	962325	1010441	1327603
Raw Materials		24670	25903	27199	28558	29986	31486	33060
Fixed Costs		50187	52696	55331	58098	61003	64053	67255
Variable Costs		26652	27985	29384	30853	32396	34015	35716
EBITDA		28743	153920	481584	798991	838940	880887	1191572
Depreciation		12405	12405	12405	12405	12405	12405	12405
EBIT		16338	141515	469179	786586	826535	868482	1179167
Taxes (IRC)		4085	35379	117295	196646	206634	217121	294792
Net income EBITx(1-IRC)		12254	106136	351884	589939	619902	651362	884375
Depreciation		12405	12405	12405	12405	12405	12405	12405
Cash-Flow		24659	118541	364289	602344	632307	663767	896780
Investment (Fixed Capital)	235240	0	0	0	0	0	0	0
Accumulate Cash-Flow/ year	-235240	-210581	-92040	272249	874593	1506899	2170666	3067446

Values in Euros (€)

After the first production, the winery will continuously produce for the next years with an increase of 5% concerning the previous year. About sales, it is to notice that in the second half of the first-year, the first sales of RTW and DBW will happen, representing this, half of the typical annual sales value for these two wines, and in the 3rd, 4th and 7th year, the sales of DGRTW, MSW and MRW will begin, respectively. From the first year of production, sales are consecutive year after year given the continuous production. Depreciation has two different depreciation rates associated: equipment and building. Being that building depreciation is around 4% per year and equipment depreciation represents 12,5% per year. The bottles are not subject to depreciation. With the basic information contextualized by the simulation and the financial assumptions, in the third year it is possible to cover the entire investment culminating with an accumulated Cash-Flow of € 272 249, despite the large investment,

after the recovery of investment, growth proceeds in a linear form, culminating with a accumulated Cash-Flow, after 7 years of the first production, of € 3 067 446, representing a growth of Cash-Flow of 36 times from the first year to the seventh year.

3.8 Risk/ Opportunity analysis.

This section approaches the analysis of different scenarios regarding price and demand, shown on figure 2 and 3.

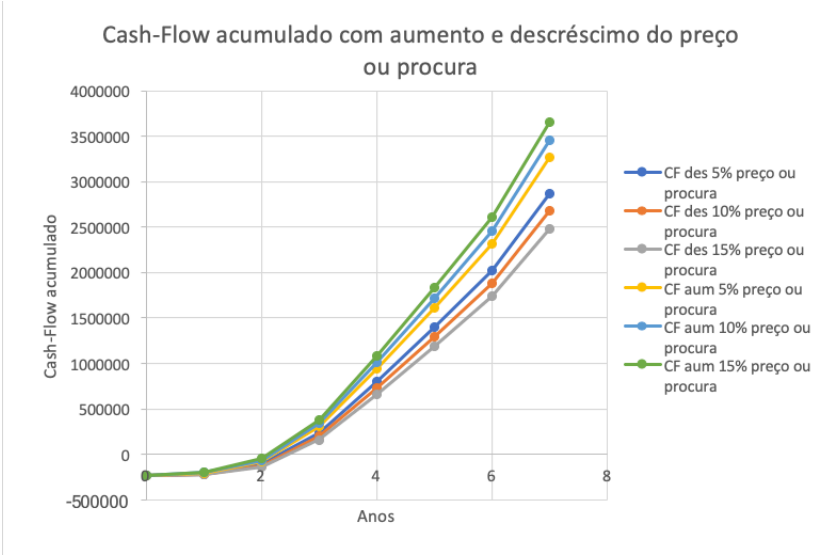

Figure 2 - Cumulative Cash-Flow evolution with increasing and decreasing of price or demand

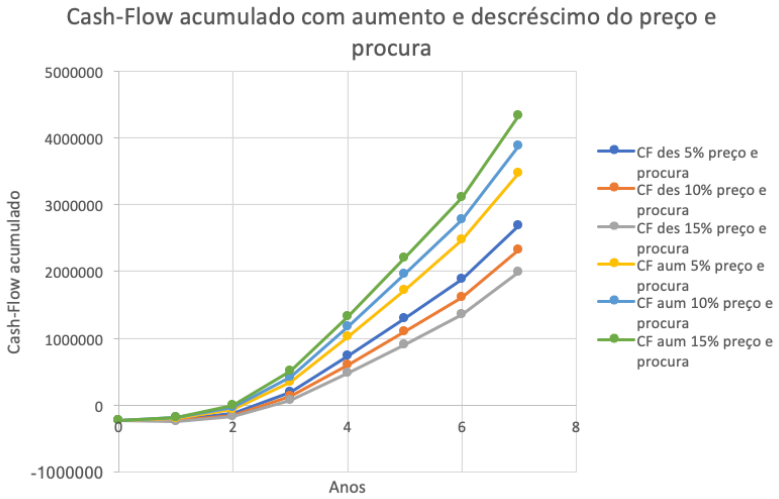

Figure 3 – Cumulative Cash-Flow evolution with increasing and decreasing of price and demand

There are 2 positive scenarios and 2 negative scenarios under analysis. Of all the scenarios, there is one that stands out by the strong impact in the early years of the project, which is the increase in demand and price of 15%, whose main consequence is the change of the payback period, culminating with an accumulated Cash-Flow in the second year of the company of 2 474 € and with an accumulated Cash-Flow in the 7th year of approximately 4,3 million euros, an increase compared to the base scenario of 41%. From the point of view of the negative scenarios, both in the decrease of price and demand, and in price or demand, the payback period is carried out in both cases in the third year, in the same way as the base scenario. In the worst of scenarios with a decrease in price and demand of 15%, the accumulated Cash-Flow in the 7th year, compared to base scenario, is reduced by 35%. The scenarios presented reveal the possibility of risk absorption by reducing the price and demand, and price or

demand. On the other hand, market opportunities can benefit the company to achieve positive results in terms of economic developments.

4 Conclusions

The creation or implementation of a new business is synonymous of major challenges, whether these are personal, financial or even at the level of management, but always with a great ultimate goal: success. This success consists, fundamentally, in the achievement of objectives in the level of business viability, correct sizing and attraction of investment and demand.

Natwine is a manufacturing company dedicated to the subsector of the Wine Industry. The great focus of Natwine is based on the three concepts, health, environment and uniqueness, to perform a Pull strategy, producing wines with totally handmade methods, with using techniques such as grape step-by-step, benefiting from the use of fully biological raw material, which shall also entitle the wine as organic wine, in addition to the characterization of a product, whose manufacture implies the concept of zero % plastic, from the harvesting of the grape to the packaging, spanning a large market from the younger generations with the consumption of 330 mL bottles to the upscale restaurants with wines like the DGRTW.

The simulation was used to replicate the wine production to correctly size the winery. The 11 processes were simulated, and from this view, the points of improvement in the vinification, were justified, in the majority of cases, by long queues, reaching an optimal scenario, in which most of the problems are solved by parallel activities application, allowing the completion of the first products in the first year of the company's existence.

With the financial plan with a horizon of 7 years, (to cover the finalization and sale of the product with the highest production time – 6 years, the MRW), it was concluded that the Cash-Flow grows 36 times from the first to the seventh year, ending with € 3 067 446 accumulated Cash-Flow in the seventh year. It is also concluded that the payback period happens on the third year, where revenues can exceed total costs.

Variations up to 15% per year on the price and demand was also simulated to evaluate the alternative possibilities to the base scenario. It was concluded that neither in the worst case scenario with the decrease in demand and price by 15% per year, the coverage point of the investment does not change, however, in the most positivistic scenario, with an annual demand and price increase of 15% a year, it is possible to reduce the total investment coverage for the implementation of the winery to 2 years.

5 References

- Banks, J. et al., 2014. Discrete-Event System Simulation 5th ed., Upper Saddle River, New Jersey:
- Domonkos, T., 2010. Computer Simulation as a Tool for Analyzing and Optimizing Real-Life Processes.
- Harrison, R.T., Mason, C. M. – Informal Venture Capital: A Study of the Investment Process and Post-Investment Experience. Entrepreneurship and Regional Development 8: 105-26. ISBN: 9780123736468
- Jackson, Ronald S. – Wine Science. Principles and Applications. 3a Edição. Canadá: Elvesier, 2008. Management Information System, 5(1), pp.13–18. Pearson Education Limited.
- Wine Institute, 2019. World Wine Consumption by Country. Available at:https://www.wineinstitute.org/files/World_Consumption_by_Country_2017.pdf;
- Wine Institute, 2019. World Wine Production by Country. Available at:https://www.wineinstitute.org/files/World_Production_by_Country_2017.pdf;