

SPARK: INDIVIDUAL ASSIGNMENT

Discovering challenges and opportunities for Microwd in Latin America through an exploratory analysis of COVID-19 using Spark

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Background/scenario description (WHAT): How can Microwd accomplish the company's 5-year objectives in the middle of the COVID-19 pandemic?

Microwd offers microcredits to female entrepreneurs in Mexico, Peru and Nicaragua to help them expand their business and improve their quality of life and the life of their families and communities. Thanks to an algorithm, Microwd can assess which applicants are more likely to return the microcredit based on over 70 variables grounded in behavioral economics. Through this, Microwd ensures individual investors based in Spain that they will recover their investment.

However, due to the global lockdown that COVID-19 has imposed, many female entrepreneurs have seen their businesses go bust in a short period of time. This affects their ability to return the microcredit and, consequently, investors' returns and Microwd's profitability.

The image below showcases Microwd's 5-year objectives according to the Theory of Change. On the business side, Microwd aimed at reducing the operational costs due to defaults or delays by 10%. On the impact side, Microwd strived to create 100,000 jobs, increase by 30% women's income and by more than 30% the number of women who saved money. Amongst its impact objectives, the company wanted to diversify its portfolio of businesses and lift 50% of women out of poverty.

Para los más metodológicos, os contamos nuestros objetivos para los próximos 5 años dentro de un marco de la Teoría del Cambio.

Estamos trabajando por conseguir los siguientes resultados para 2024:

OUTPUT (impacto directo)

- 40.000 créditos otorgados.
- 88% de nuestras mujeres han recibido formación.

OUTCOME (impacto generado por mujeres MICROWD)

- 100.000 empleos creados.
- Reducción del 10% los costes operativos debido a impagos y retrasos bajos.
- 30% de aumento de ingresos de las mujeres.
- >30% de las mujeres ahorran.

IMPACTO (impacto en la comunidad)

- >20% invertirá en la salud.
- 50% superan el umbral de la pobreza.
- 35% de aumento de diversidad de negocios.
- >30% mejora la vivienda.
- >50% de las madres invierten en los hijos.

Figure 1: Microwd's 5-year plan, structured according to the framework of Theory of Change

Is this still possible in times of a pandemic?

As a social enterprise, Microwd's prosperity is interlinked with the positive impact it is able to create. In other words, the higher the number of women who receive a microcredit and return it, the greater Microwd's impact and profits. Therefore, in order to survive in a scenario dominated by the coronavirus, Microwd must assess the impact of COVID in the regions in which there are microcredit beneficiaries, and design a strategy that boosts female entrepreneurship and successful ventures.

Goal of the analysis (WHY): What has been the impact of coronavirus in the regions targeted by Microwd and in which ways can Microwd respond in light of this information?

Microwd has quantified the impact of COVID-19 on its portfolio (see image below). As the image below showcases, Microwd's team is already working towards mitigating the negative impact of this health crisis. One of its tactics is to invest in active businesses of high impact.

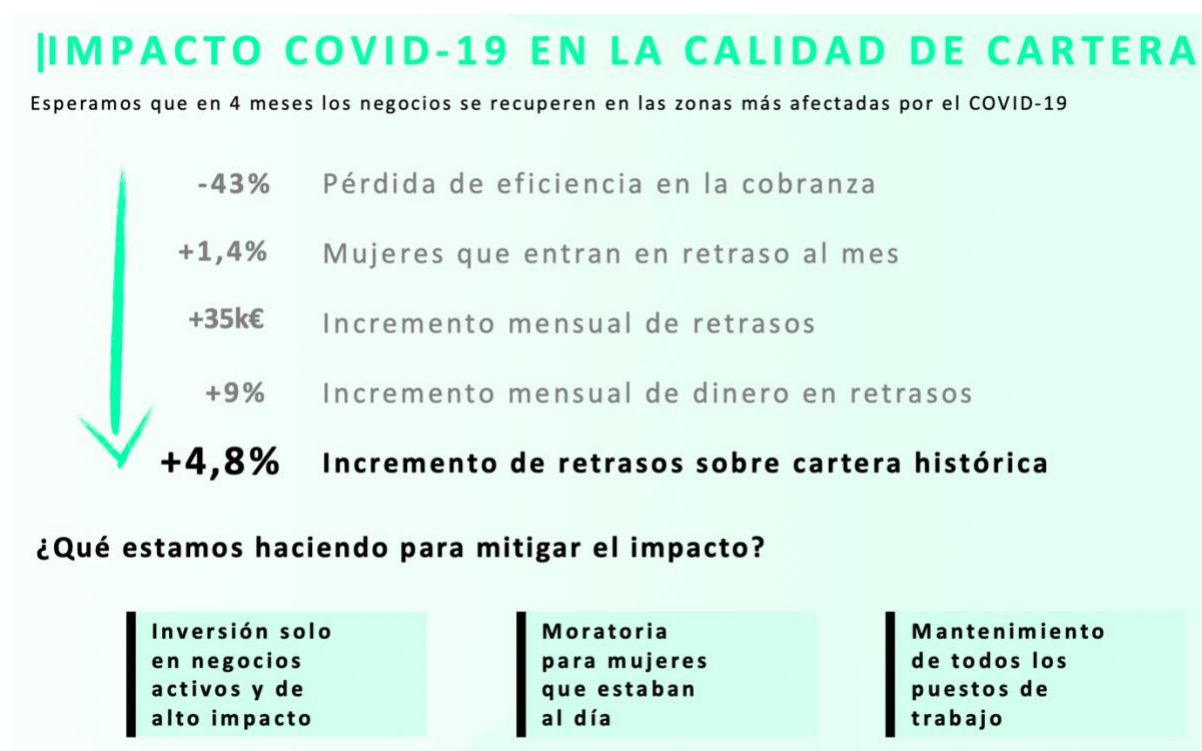


Figure 2: Impact of COVID-19 on Microwd's portfolio and current approaches to mitigating impact

This exploratory analysis will dive deeper into the assessment of COVID-19's impact and cross-assess these findings with Microwd's business evolution over the last six months. As a result, this analysis will contribute useful data for designing a strategy of growth in the middle of the coronavirus pandemic, that may or may not deviate from the current contingency plan.

Therefore, the goal of this analysis is to find challenges and opportunities in this situation through an exploration of how the virus has affected the countries in which Microwd operates in order to revitalize female entrepreneurs' commercial activities in Latin America.

Learning which regions have been most severely hit by the pandemic will help Microwd decide whether to take a more proactive stake in (re)constructing the microbusiness ecosystem or, on the contrary, minimize the businesses in its portfolio located in these areas.

In addition, contrasting the evolution of the pandemic in these locations against the number of women requesting microcredits and the type of businesses for which women have been requesting microcredits since the beginning of the pandemic will serve to understand the opportunities that female entrepreneurs perceive in this crisis.

Women could be requesting a microcredit in order to sustain themselves in this difficult period without any intention to build or expand a business or return the loan. However, an algorithm does the first classification – potential candidate or not – and an expert validates this outcome. Hence, an increase in the number of potential candidates indicates that there are female entrepreneurs actively seeking profitable opportunities in this crisis.

Moreover, clear patterns in the sectors or types of businesses pursued by female entrepreneurs will provide insights into the economic situation in these areas as well as the skills and interests of the women located in these regions.

With this information, Microwd can decide whether to respond to the immediate demand or build a different one. For instance, it is expected that businesses belonging to the food and health sector will expand in the future as they have been considered essential goods and services during the pandemic. Should Microwd empower this movement or should it invest resources in building a different kind of entrepreneurial trend? For example, provided women have the resources and skills, it could be interesting to foster a social entrepreneurial trend within the tech space in some regions.

All in all, the answers to these questions will help Microwd develop a business strategy that is grounded in the status quo, and helps the company meet its quinquennial objectives. To accomplish this, the first step is to conduct an exploratory analysis of the impact of coronavirus in the countries and regions in which the company's beneficiaries reside. Then, a cross examination between these findings and the evolution of the business between January and September 2020 will provide further insights that will be useful in designing a coherent and impactful strategy.

Analysis deep dive (HOW): Are there any correlations between the pandemic and Microwd's evolution throughout the last six months?

To combat the health crisis brought by the coronavirus, many countries resorted to partial or general lockdowns which, consequently, led to an economic paralysis. In light of the negative economic consequences of the coronavirus and the preventative measures imposed by governments to manage the health crisis, exploring the economic viability of business ventures requires examining the numbers related to the coronavirus pandemic. In particular, **the number of confirmed cases, recovered patients and deaths between January and September 2020.**

One could argue that the monitorization of the figures of confirmed cases and deaths due to coronavirus has been highly erratic across the world. However, the mere effort to provide

indicative figures demonstrates an interest in society's health and in the country's reputation, which is interesting from an economic, trade and impact perspective.

Furthermore, both the rate of confirmed cases and deaths have economic impact. In the majority of countries, a high presence of confirmed cases and deaths due to coronavirus forced the authorities to impose extraordinary measures, such as lockdowns, that negatively impacted the possibility of Microwd's female entrepreneurs to work on their business.

In addition, whilst the Nicaraguan government has not condoned a general lockdown and actually openly discouraged people from staying at home, the OECD still expects the pandemic to cause the Nicaraguan economy to further contract due to reduced trade, tourism and remittance inflows.¹

Thus, to understand the impact of COVID-19 on Microwd, it is relevant to compute the total number of confirmed cases and deaths due to coronavirus in **Mexico, Peru and Nicaragua**, where Microwd is expecting hundreds of female entrepreneurs to repay their microcredits.

Research questions:

The exploratory analysis responds to the questions below:

- Number of confirmed cases and deaths in the countries in which Microwd operates
- Regions that have been more severely hit by coronavirus per country
- Ratio between confirmed cases and deaths in the top regions in each country and in the rest of the country
- Weeks of higher cases of deaths due to covid-19

Dataset

To resolve these queries, we based our exploratory analysis on a comprehensive dataset with more than 100,000 rows compiling the total figures of confirmed cases, deaths and recovered individuals across the world from January till September. In addition to these variables, the dataset also indicated the Observation Date, Last Update, Country/Region, Province/State used.

For the sake of simplicity, the dataset was filtered to select the countries of interest and new date-related variables were added on R Studio to code in a more efficient manner and obtain clearer results.

The dataset used can be found [here](#).

Process

The exploratory analysis was conducted in Spark, an open-source framework that is especially effective in analyzing vast amounts of data efficiently and effectively. Once the csv is read in the Spark session, we begin to write a code in Python to obtain the answers to the research questions. Spark translates this Python code into Scala and quickly performs the operation. To make results clearly and easily understandable, we instruct Spark to show the results in the form of a table, which can be used to showcase findings in reports and presentations.

¹ <https://www.worldbank.org/en/country/nicaragua/overview>

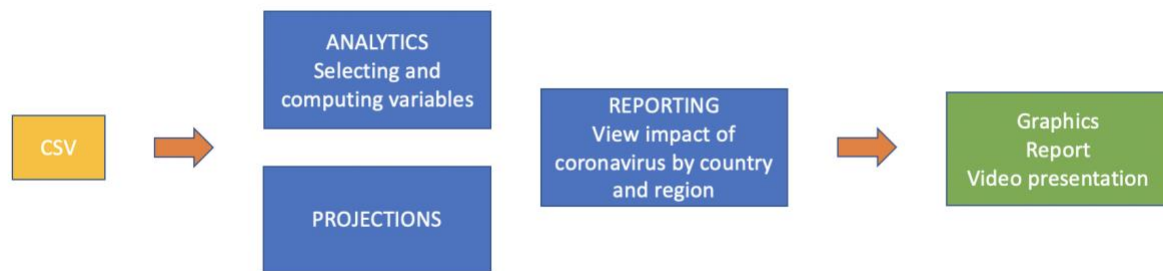


Figure 3: Stages in the exploratory analysis with Spark.

Results

A. Number of confirmed cases and deaths in the countries in which Microwd operates

The first thing we notice is the significant difference between Nicaragua's number of deaths and confirmed cases in comparison to the other two countries. This was expected because of the differences in size and population between these countries, as well as the controversial and opaque management of the pandemic by the Nicaraguan government.

Country_Región	Confirmed	Deaths	Recovered
Nicaragua	328133	10745	214987
Peru	44045174	1781960	28293450
Mexico	38996121	4334259	30674174

Figure 4: Total figures of confirmed cases, deaths and recovered individuals based on the exploratory analysis carried out with Spark.

B. Regions that have been more severely hit by coronavirus per country

The Mexican regions that have been most heavily impacted by coronavirus are located in the northern and central areas of Mexico. However, most of Microwd's investees over the last six months live in the southeast – namely, in Campeche and Yucatan. Therefore, there does not seem to be a linear correlation between the health crisis and the demand of credit in Mexico.

Country_Region	Province_State	Confirmed	Deaths
Mexico	Ciudad de Mexico	6973099	827157
Mexico	Mexico	4856447	563915
Mexico	Tabasco	1843789	174606
Mexico	Veracruz	1806835	241427
Mexico	Guanajuato	1723171	94838
Mexico	Puebla	1716279	217310
Mexico	Nuevo Leon	1513368	105064
Mexico	Sonora	1396179	152570
Mexico	Tamaulipas	1338299	93847
Mexico	Baja California	1267755	248119
Mexico	Jalisco	1184463	136620
Mexico	Sinaloa	1159995	193710
Mexico	Coahuila	1120183	65755
Mexico	Guerrero	942270	119786
Mexico	Michoacan	916235	71959
Mexico	Oaxaca	888948	83328
Mexico	San Luis Potosi	869255	51404
Mexico	Yucatan	861139	78878
Mexico	Quintana Roo	668827	93800
Mexico	Hidalgo	641643	102357

Figure 5: The top 20 Mexican regions with the highest recorded impact of coronavirus

A more in-depth study that combines both quantitative and qualitative data is required to understand the consequences derived from coronavirus in the businesses located in the South. Is there now a market opportunity in the South? If so, in what sector and of what type? Is it sustainable or does it only fit in the context of coronavirus?

On the contrary, a significant proportion of the Peruvian female entrepreneurs who have requested microcredits from Microwd over the last six months live in three regions that have been severely hit by coronavirus: Arequipa, San Martín and Tacna.

Country_Region	Province_State	Confirmed	Deaths
Peru	Lima	21410137	772197
Peru	Callao	2154571	97222
Peru	Piura	2074635	117939
Peru	Lambayeque	1685899	111369
Peru	Arequipa	1546332	61307
Peru	La Libertad	1447516	114960
Peru	Ica	1207856	84140
Peru	Ancash	1175843	74818
Peru	Loreto	1126506	55891
Peru	Ucayali	987033	21296
Peru	San Martin	790425	32150
Peru	Junin	768191	33529
Peru	Cajamarca	650925	18659
Peru	Huanuco	599115	16624
Peru	Cusco	570685	11216
Peru	Amazonas	522782	11127
Peru	Ayacucho	390909	9659
Peru	Tumbes	388224	18479
Peru	Moquegua	357975	9019
Peru	Tacna	335415	5020

Figure 6: Figure 4: The top 20 Peruvian regions with the highest recorded impact of coronavirus

It is relevant to note that only 9 entrepreneurs out of 184 did not request a microcredit for businesses related to essential goods. So, the majority of women sought money for agricultural activities or retail within the food sector. Yet, the economies of Arequipa and San Martín, to put an example, differ greatly from one another. Whilst retail and services represent almost half of Arequipa's GDP, tourism dominates in San Martín. Thus, what does this tell us about female entrepreneurs' understanding of the market and perception of market opportunities?

Having identified the regions with the highest number of cases of coronavirus, there are many interesting leads for research that can be derived. However, to sum up this section, the key question that the company must address after this exploratory analysis is what the role of female entrepreneurs is in the resulting scenario. Specifically, which sectors should Microwd target and, in what type of entrepreneurial ideas should resources be invested, in order to maximize the positive consequences of each microcredit and create sustainable impact?

Financing ventures dealing in the scope of essential goods may provide a short-term solution for some women. However, more research needs to be done to assess how financially viable is this strategy in the long term and to what extent it will be able to create a systemic change that empowers female entrepreneurs and reduces poverty, unemployment and inequality.

C. Weeks of higher cases of deaths due to covid-19

In Mexico, Peru and Nicaragua, cases peaked in week 36 (Monday 31st August - September 6th) and recent news indicate that this is a consistently increasing trend. Simultaneously, the number of women requesting microcredits doubled from June to July, and figures for August also expressed an increasing trend. In response to this, Microwd also increased the number of credits emitted throughout the period.

In this case, we see a parallel upward trend. However, it would be advantageous to know, firstly, if the women who have requested credits from Microwd these months are recurrent entrepreneurs and recurrent Microwd clients. In addition, it would be interesting to understand their motivations towards requesting a credit beyond the purpose for which the credit is intended. In other words, why did these entrepreneurs request financing from Microwd?

The response to this question will shed light on the type of entrepreneurs these women are and will help Microwd conceive strategies that help both parties maximize their impact. For instance, let us briefly consider access to finance as a potential influential factor. On September 8, the CAF Banco de Desarrollo de América Latina and Nacional Financiera offered over 5 million pesos in credit lines to support more than 135,000 micro businesses and SMEs in Mexico². However, the method employed to distribute the financing required businesses to have a bank account. According to the sample of Microwd's beneficiaries studied in this analysis, only 8 out of 184 women have a bank account.

Therefore, more data will indicate whether it is access to finance or another variable what attracts female entrepreneurs to request Microwd's microcredits in times of COVID-19. With this information, the company can better assess how to leverage the value of these entrepreneurs and maximize the impact opportunity.

² <https://www.caf.com/es/actualidad/noticias/2020/09/covid-19-mas-de-135-mil-mipymes-mexicanas-se-benefician-de-la-alianza-entre-caf-y-nafin/?parent=53444>

Country_Region	date_week	Confirmed	Deaths
Mexico	36	4394742	470145
Mexico	35	4132689	445448
Mexico	34	3879277	420181
Mexico	33	3612348	393964
Mexico	32	3322735	362762
Mexico	31	3016278	330148
Mexico	30	2685009	301695
Mexico	29	2361762	270747
Mexico	28	2057399	242067
Mexico	27	1754303	211680
Mexico	26	1484590	183082
Mexico	37	1299685	138698
Mexico	25	1228012	147788
Mexico	24	997008	117652
Mexico	23	792069	93356
Mexico	22	612987	67569
Mexico	21	458829	49929
Mexico	20	330155	34684
Mexico	19	231905	23142
Mexico	18	154251	14556

Country_Region	date_week	Confirmed	Deaths
Peru	36	4726505	206596
Peru	35	4411356	199212
Peru	34	4030867	190700
Peru	33	3632944	173975
Peru	32	3281620	145799
Peru	31	2918190	135106
Peru	30	2650251	121980
Peru	29	2443641	90782
Peru	28	2262031	81782
Peru	27	2092859	72856
Peru	26	1928641	63919
Peru	25	1754154	54727
Peru	24	1559032	44991
Peru	37	1398966	60359
Peru	23	1341217	37162
Peru	22	1087814	30459
Peru	21	813930	23662
Peru	20	616635	17702
Peru	19	448393	12595
Peru	18	298389	8392

Country_Region	date_week	Confirmed	Deaths
Nicaragua	36	32826	990
Nicaragua	35	31632	963
Nicaragua	34	30360	935
Nicaragua	33	29001	901
Nicaragua	32	27527	866
Nicaragua	31	25934	819
Nicaragua	30	24306	764
Nicaragua	29	22321	702
Nicaragua	28	20223	645
Nicaragua	27	17960	589
Nicaragua	26	15539	527
Nicaragua	25	13108	458
Nicaragua	24	10607	394
Nicaragua	37	9636	288
Nicaragua	23	8172	331
Nicaragua	22	5672	256
Nicaragua	21	2408	137
Nicaragua	20	404	65
Nicaragua	19	121	38
Nicaragua	18	101	27

D. Ratio between confirmed cases and deaths in the top regions in each country and the total figures of that specific country on average

There are a number of factors that cause the massive spread of coronavirus - population size, population density, low-quality housing, poor or limited access to health resources, and a long list of unknowns. Similarly, we do not know the breadth and depth of the economic consequences. Yet, being able to correctly describe the current status quo will give us a lead in understanding not only what the market is going to look like, but also what we want it to look like and how we can start building it.

The question on ratios between regions and countries as a whole serves this purpose. We do not know yet why the ratio of confirmed cases and deaths between Arequipa and Peru is 0.94 and 0.92, respectively. We can allude to its population size, but what is of real interest is that the region is greatly suffering from this health crisis and that a large proportion of the female entrepreneurs bidding for a microcredit are based in Arequipa. Therefore, the desperate and critical situation in this region provides a clear breeding ground for impactful solutions.

Furthermore, whilst the high ratio between Yucatan and Campeche with Mexico is slightly more moderate in comparison, Yucatan still catches our eye. Being Mexico the size of 23 European countries, one would expect this Central American country to report a high number of confirmed cases and deaths due to COVID-19. However, the figures have surpassed manageable limits and the ratio between Yucatan and Mexico is, consequently, alarming.

As a heavy agriculture-dependent region, trade and commerce are pivotal to the area of Yucatan. Therefore, a more in-depth research is needed in order to adequately comprehend what the economic situation looks like and what roles can female entrepreneurs take to create a “new normal” - a new market that improves their economic position and their families’ and communities’ wellbeing.

Province_State	Confirmed	Deaths	Confirmed_Peru	Deaths_Peru	RatioConfirmedPeru	RatioDeathsPeru
Puno	3004.98	84.11	15514.33	627.67	0.19	0.13
Tacna	3164.29	47.36	15514.33	627.67	0.2	0.08
Arequipa	14588.04	578.37	15514.33	627.67	0.94	0.92
San Martin	7456.84	303.3	15514.33	627.67	0.48	0.48

Figure 7: Ratio of confirmed cases and deaths on average between Microwd's main areas of business in Peru and the overall country of Peru

Province_State	Confirmed	Deaths	RatioConfMex	RatioDeathsMex
Yucatan	7553.85	691.91	0.72	0.6
Campeche	3135.63	384.44	0.3	0.33

Figure 8: Ratio of confirmed cases and deaths on average between Microwd's main areas of business in Mexico and the overall country of Mexico

Conclusions (insights):

Exploring the impact of coronavirus in the regions in which Microwd’s beneficiaries are located enables a better understanding of the challenges and opportunities created by the pandemic in each region.

Focus on sustainable farming to exploit the momentum of environmentally friendly consumption movements

According to Microwd’s data, female entrepreneurs seem to be targeting the agricultural and food retail spaces – possibly, to take advantage of the window that essential products leave open in the middle of a lockdown. Sadly, many experts would argue that the long-term sustainability of this type of business is debatable, especially in the event of an overcrowded supply.

However, encouraging Latin American women to carry out organic farming that is environmentally sustainable may ensure a long-term commercial interest both from the local

and international levels. After all, the pandemic has put responsible and sustainable behaviors towards nature and living beings at the epicenter of critical discussions over the causes and consequences of the pandemic within the framework of consumer behavior.

As a matter of fact, over the last six months, Bill Gates has grown to be perceived as a visionary in terms of human crises and life sciences and his messages are resonating within many social groups. Since Gates declared that the next global crisis that will take place will be related climate change, many governments, businesses and nonprofits have taken action to design more environmentally sustainable products, services, supply chains and consumer behaviors.

Therefore, should the money currently be in agriculture, farming and food commerce, Microwd can consider adapting building an entrepreneurial momentum based on ecological market trends.

Nevertheless, more data on female entrepreneurs' entrepreneurial behavior, skillset and resources is needed to validate this strategy.

Building a social economy

Moreover, it is clear that neither Microwd nor one single female entrepreneur will be able to create a systemic change that boosts economic growth in areas in which poverty is going to become even more severe due to the impact of the coronavirus. Therefore, as the figure below showcases, social innovation can be extremely useful to build a social economy in which each individual develops a financially viable project which is able to report benefits to her family and her community.

In fact, on July 30th 2020, the OECD published a report calling for responses aligned with “social innovation” principles to tackle coronavirus. The OECD argued that social innovation has proven to be able to both repair and transform the economic system by effectively addressing market and state failures³.



Figure 9: The essence of a social economy according to the OECD⁴.

Thus, Microwd has here a valuable position. On the one hand, the company is socially innovative and has vast experience generating positive impact. On the other hand, the team has experience in training female entrepreneurs in subjects related to entrepreneurship and business

³ https://read.oecd-ilibrary.org/view/?ref=135_135367-031kjiq7v4&title=Social-economy-and-the-COVID-19-crisis-current-and-future-roles (p.7, p.25)

⁴ https://read.oecd-ilibrary.org/view/?ref=135_135367-031kjiq7v4&title=Social-economy-and-the-COVID-19-crisis-current-and-future-roles (p.3)

management and has remained in contact with the beneficiaries of the microcredits. Therefore, Microwd can integrate social innovation into its investment strategy, and train female entrepreneurs in this subject.