VALUE CHAIN ANALYSIS FOR HYDRONIC HEATING BOILERS AND STAINLESS STEEL WATER HEATERS

CREDO KRAJINA

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thinkworkshop

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Contents

1. Introduction

CREDO Krajina is a project funded by Sweden and implemented by the Enterprise Development Agency Eda from Banja Luka in cooperation with the Association for Development NERDA from Tuzla.

The project aims to improve competitiveness of small and medium enterprises in the Krajina area, in order to create and sustain jobs, reduce poverty and improve economic status of the area. The project shall support creation of more than 200 new jobs and keeping of 1000 jobs in companies / sectors covered by project interventions. Also, the project should facilitate vertical and horizontal coordination of policies directed towards small and medium enterprises in the project area.

Duration of the Project is 30 months and it consists of multiple phases and components. Priority economic sectors with significant potential for creating new jobs were selected through initial analysis and, then, representatives of companies from these sectors, through sectorial committees will define priority needs for advisory support and training. In addition, part of the advisory and financial support will be directed towards cities and municipalities that intend to significantly improve local business environment and to establish permanent and effective dialogue with the private sector.

We extend our gratitude to sector experts, members of Sector Boards, participants in workshops, survey, and interviews conducted within the project for their help in implementation of research. We would like to thank especially to Mr. Shawn Cunningham and Mr. Frank Waeltring from Mesopartner for methodological guidance and advisory support in preparation of value chain analysis.

2. Research Approach

The study was designed as a combination of qualitative and quantitative research. Based on the findings of the Baseline study of economic sectors, four priority sectors with the greatest potential for growth and employment were identified. One of them is metal industry. Interviews were conducted with directors and/or owners of 31 company from this sector in order to identify the most important characteristics of their businesses, as well as to obtain information about implemented innovations and intended investments in the future.

Table 1. Interviewed companies within metal industry in period of July - September 2013

Company name	Municipality/City
Elas komerc doo	Banja Luka
Mon Amie doo	Banja Luka
Procesna oprema doo	Laktaši
Tri Best doo	Banja Luka
Bira dd	Bihać
Fiko commerce SF doo	Cazin
Gat doo	Sanski Most
Čekić doo	Gradiška
Ewes doo	Gradiška
KGS doo	Derventa
Maxmara doo	Banja Luka
Metal-prom MB doo	Derventa
PMP Jelšingrad - Fabrika Mašina ad	Gradiška
Vigmelt doo	Banja Luka
Mehanizmi B doo	Gradiška
Metal ad	Gradiška
Metalac MBM doo	Derventa
Metaloprom Kovačević doo	Gradiška
Mreža Network doo	Derventa
Nivex doo	Derventa

Company name	Municipality/City
Krupa kabine doo	Bosanska Krupa
Limometal doo	Cazin
Livnica Tešić doo	Gradiška
Novi most doo	Bosanska Krupa
Protherm doo	Kostajnica
Remus Innovation doo	Sanski Most
Stampress doo	Cazin
Unametal ad	Novi Grad
ZAH doo	Bosanska Krupa
Č.J. doo	Bihać
Bosnamontaža ad	Prijedor

These findings are used to identify and analyze value chain in production of hydronic heating boilers and stainless steel water heaters, as a segment of the metal industry with relatively high rates of growth and good development perspectives. Value chain can be defined as a series of organizations and institutions involved in the process of creating and delivering of product/value for consumer - from procurement, over production and distribution, to the final consumer. Conducting of the value chain analysis is important because of the fact that the competitiveness of a particular company is largely determined by competitiveness of its suppliers and customers, as well as relevant supporting institutions. Also, we should be aware that competition between enterprises implies (and involves) competition between their value chains. Competitors may copy a company's product relatively easily, but it is much more difficult to copy relations between its suppliers and customers. Having that in mind, interviews with both producers of hydronic heating boilers, water heaters and their suppliers and customers were conducted. That is the way to identify quality of their relationships as well as areas that should be improved in order to achieve benefits for all the participants in the value chain.

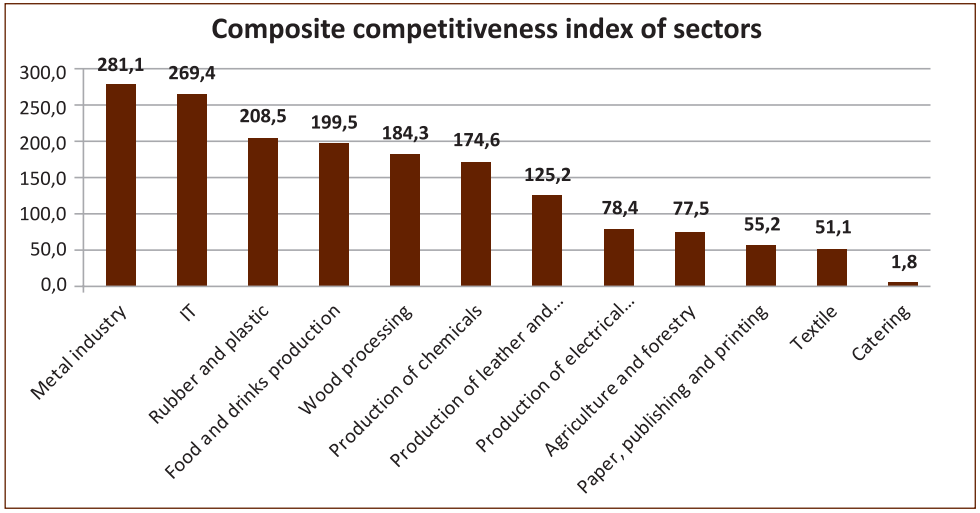
Table 2. Interviewed companies within the selected value chain in the period of December 2013 - February 2014

Company name	Municipality/City	Position in the value chain
Tehsan doo	Banja Luka	Distributor - retailer
Vokel doo	Banja Luka	Distributor - retailer
Termotehna doo	Banja Luka	Distributor - retailer
Centrum trade doo	Banja Luka	Distributor - retailer
Topling doo	Prnjavor	Producer of hydronic heating boilers
Termoflux doo	Jajce	Producer of hydronic heating boilers
Termoklima doo	Laktaši	Producer of hydronic heating boilers
Procesna oprema doo	Laktaši	Producer of stainless steel water heaters
Milco doo	Laktaši	Supplier
Fit doo	Banja Luka	Supplier
Bob doo	Laktaši	Supplier

3. Overview of Metal Industry and Selected Value Chain

In area covered by the CREDO Krajina project, sector of metal industry includes 308 companies that employ 5,104 workers. These companies have achieved a total turnover of about KM 600 million, of which KM 372 million derives from export. Total profit of these companies is KM 35 million, so that the average profit rate is around 5.83%. Metal sector is the leading one – it has the highest composite index of competitiveness in comparison with other business sectors in the project area (Pucar, 2013, pp. 75, 99).

Figure 1. Composite competitiveness index of sectors



Source: Pucar, 2013, p. 99.

As previously mentioned, the value chain analysis is conducted on the segment of metal industry dealing with production of hydronic heating boilers and stainless steel water heaters.

Hydronic heating boilers use biomass as an energy source. Biomass consists of residues from agriculture and forestry that can be used as fuel for heating. Pellet, as a basic unit in the production of biomass, has a degree of utilization of 95% and its price is competitive with coal, wood or oil fuel. In conventional boilers, which use solid fuel, a large amount of that solid fuel does not turn into thermal energy (because the

combustion is not complete and unburned material transforms into ash and smoke as waste). Pellet boilers have electronically controlled and optimized combustion, so burning process is complete with a good thermal energy and reduced emissions of hazardous gases. Therefore, this method of heating is more economical and environmentally friendly than the existing forms of heating, which use solid fuel or heavy oil fuel. Buying of hydronic heating boilers is subsidized by many EU countries (Slovenia, Austria, Germany, etc.). Because of all these facts, expansion of this type of heating can be expected in the future. In the area covered by the project, producers of hydronic heating boilers are:

- Topling doo, Prnjavor
- Termoflux doo, Jajce and
- Termo Klima, Laktaši.

Data on import and export of central heating boilers are presented in the following tables.

Table 3. Import of central heating boilers (product code 840310) in BiH

Exporters	Imported value in 2013 (USD thousand)	Imported quantity in 2013 (tons)	Imported growth in value 2009-2013 (%, p.a.)	Imported growth in quantity 2009-2013 (%, p.a.)
Croatia	2876	663	-9	-16
Serbia	1312	384	-5	-5
Slovakia	1050	85	-10	-10
Germany	1039	131	-19	-11
Czech Rep.	665	217	-7	-14
Slovenia	571	90	25	21
Turkey	460	174	19	12
Italy	234	68	-13	0
Bulgaria	189	63		
Poland	118	41	72	62
Austria	88	8	63	24
Netherlands	33	1		
Portugal	29	2		
Switzerland	21	1		-24
Greece	14	2		
Montenegro	1	0		
TOTAL	**8700**	**1930**	---	---

Source: Trade Map - Trade statistics for international business development, 2014

Table 4. Export of central heating boilers (product code 840310) in other countries

Importers	Exported value in 2013 (USD thousand)	Exported quantity in 2013 (tons)	Exported growth in value 2009-2013 (%, p.a.)	Exported growth in quantity 2009-2013 (%, p.a.)
Austria	5784	3752	44	42
Slovenia	1375	268	80	98
Croatia	785	152	52	27
Serbia	464	89	1	-17
Germany	346	42		
FYR of Macedonia	316	62		131
United Kingdom	180	36		
Montenegro	162	29	36	27
Belgium	158	23		
Greece	105	28		
Portugal	83	18		
Denmark	72	7		
Hungary	65	11	-15	-29
Italy	63	13	5	-10
Luxembourg	45	7		
Spain	27	6		
Bulgaria	7	1		
Netherlands	7	1		
France	6	1		-52
Romania	6	1		
Sweden	6	0		
TOTAL	**10062**	4547		

Source: Trade Map - Trade statistics for international business development, 2014

It can be concluded that total import is 10.062.000 USD and total export is 8.700.000 USD. In terms of quantities, 1,930 tons were imported and 4,547 tons of these products were exported in 2013. Therefore, coverage of import by export is around 115.66% (in terms of value), i.e. 235.60% (in terms of quantities), so it is clear that surplus is achieved in this category of foreign trade exchange of products. However, if

we compare the value per quantity of imported versus exported boilers, the situation is quite different. Namely, the value of imported boilers is 4,547.77 USD/ton, while an average value of exported boilers is 2,212.89 USD/ton. The difference is more than double!

Generic value chain of hydronic heating boilers and stainless steel water heaters is presented on the following picture.

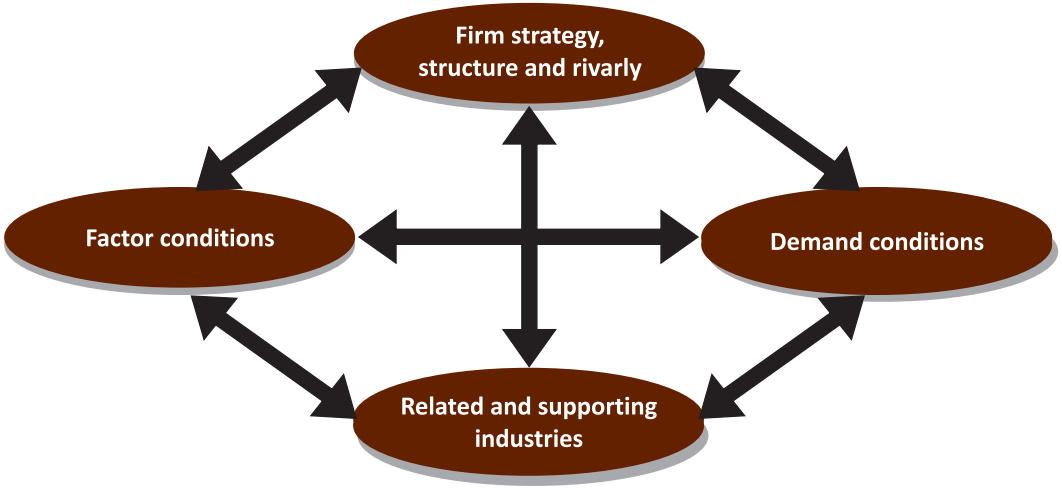
Figure 2. Generic value chain of hydronic heating boilers and stainless steel water heaters

Producers design and prepare technical documentation for their products on their own or with assistance of experts from the Faculty of Mechanical Engineering of Banja Luka. Most suppliers are wholesalers from BiH that buy raw materials (sheet metal etc.) from producers located in the Western Balkans and the EU. It is an interesting fact that there are no producers of raw materials for hydronic heating boilers in BiH. Steel factory Arcelor Mittal from Zenica produces steel products that can be used in construction industry (eg. reinforcement nets and ferroconcrete), but not for production of hydronic heating boilers and stainless steel water heaters. Produced hydronic heating boilers and stainless steel water heaters (for households) are sold to retailers and then to final consumers. Hydronic heating boilers are usually installed by local artisans, while service is provided by producers.

4. Industry Competitiveness (Porter's Diamond)

Michael Porter's "diamond" of competitiveness attempts to isolate the factors that influence the competitiveness of industries and nations (1998, p. 71). The diamond is frequently used in country and industry-specific competitiveness assessments and benchmarks.

Figure 3. Porter's diamond of competitive advantage



Source: Porter, 1998, p.72

4.1 Structure and Strategy of the Leading Companies

Local manufacturers do not recognize themselves or their local competitors as leading firms, so that only international companies are perceived as the leading ones. Since the metal industry is highly globalized, the leading companies are from the Western Balkans and the EU. These companies have concentrated significant financial and human resources, and they have strong R&D capacities. The leading companies create and establish product and business standards, which other companies have to follow (e.g. the company Otis with its elevators). Some kind of a local leader in the production of hydronic heating boilers could be Topling doo from Prnjavor, since it produces complex hydronic heating boilers for industrial customers (the other competitors produce only relatively standardized hydronic heating boilers for households) and since it has more employees than other competitors have. Generally, there is great mistrust towards domestic producers and their products, although their quality is equal or even better in comparison with foreign brands (poor branding/reputation of BiH firms). That is way domestic producers usually do not sell their products on foreign markets using their brand names (they use distributors' brand names). Domestic producers have a problem with finding new markets (customers) and access to finance (solvency is often threatened due to problems in collection of receivables). Cooperation between producers is not evident. Some of companies wanted to initiate cooperation with their competitors, but there was no interest for that from the other side. Main priorities for the future are further improvement of products' quality, increase of production scale if possible, keeping good relations with the existing and finding new customers.

Looking at the metal industry on the whole, it may be concluded that most companies in metal industry are quite passive – they wait for potential customers, to come with their technical drawings and design, asking for the cheapest offer for production, to offer their services, while the customers are always trying to find the one amongst them to offer them the lowest price. A relatively small number of companies (like these in the selected value chain – Topling, Thermoflux, Termo Klima and Procesna oprema) have their own products. Quality of their core products is good (even or better in comparison with competitors), but aesthetics could be better (industrial design).

4.2 Factor Conditions

Over 90% of input materials for producing hydronic heating boilers is imported. Producers of hydronic heating boilers usually buy input materials (e.g. sheet metal) from distributors from BiH (e.g. Bob d.o.o., Laktaši; Milco d.o.o., Laktaši; Bogner Edelstahl d.o.o., Vitez etc.) who import them directly from producers in Italy, Germany, Slovakia and other EU countries. Payment conditions are quite unfavorable – payment in advance or in quite a short period. Only one of the bigger companies buys sheet metal directly from the producer in Slovakia. Other components for hydronic heating boilers (motors, heaters, fans, etc.) are bought either directly from producers or from their distributors in EU.

Electricity supply is quite expensive with occasional disconnections of its supply, which is more characteristic for small municipalities such are Kostajnica and Novi Grad. That causes stoppages in production, prolongs lead times, it negatively affects the machines and creates higher electrical energy costs. After establishing of electricity supply again, the peak load price is higher, so it generates additional costs. Public companies in charge of the distribution of electricity do not suffer any consequences for the incurred damage and costs.

It is difficult to access finance, due to bureaucratic and sometimes also political issues. Interest rates on bank loans are very high, so producers try not to use them. On the other hand, there are subsidies provided by the Ministry of Industry, Energy and Mining of the Republic of Srpska for export companies. All producers in the selected value chain have got this kind of financial support.

There is an evident deficit of relevant human resources (engineers, technicians), but their quality is often more problematic then their availability. There are two relevant secondary schools in the project area (Technical School in Banja Luka and Mechanical-Transportation Mixed Secondary Sschool in Bihac), but the quality of knowledge and especially skills of the pupils are limited. Besides that, their motivation and working habits are often critical. Representatives of companies perceive that at a production level, 50% of staff are motivated and skilled and 50% are low skilled and not interest to upgrade. So, companies often must invest time, energy and money to improve their knowledge and skills as prerequisite to use them. On the other hand, there is a risk that employees who are “internally” educated leave and start working in competitors’ company or perhaps they can establish their own company.

The situation is quite similar with the Faculty of Mechanical Engineering in Banja Luka and Technical Faculty (Mechanical Department) in Bihac. The number of students is not sufficient (in comparison with the production sector demand), although the number of enrolled students in the Faculty of Mechanical Engineering in Banja Luka has been increased. After they graduate, a lot of engineers leave the country and find jobs in the EU. It should be mentioned that some curricula should be improved and modernized (as well as knowledge of lecturers), because in some areas graduated students do not have required practical skills. There is no sufficient cooperation between faculties and business sector. In many cases, that cooperation is based on consulting services of skilled individuals (professors, assistants) and not on services provided by faculties. The Faculty of Mechanical Engineering in Banja Luka has recently got new equipment for laboratories, so the basis for providing services and cooperation was improved. It is still an open issue as to how that equipment will be used (education/providing services ratio) and promoted towards business sector.

Many companies perceive that their major competitive advantage is low cost human resources (engineers). But it is questionable if this competitive advantage is sustainable, and if this is (or should be) the right competitive advantage…

Water, electricity, communal services are much more expensive for industry than for households. In other countries this is the other way around.

4.3 Supporting and Related Industries

Generally speaking, synergy between government, industry and academia is at a low level. Thus, for example, the Mechanical Faculty of the University of Banja Luka, taking into account the equipment it has at its disposal, is available to provide services to companies in regard to product design, production of a prototype and many other areas, however, in practice, this does not happen too often. The Faculty, as an institution, is not enough oriented towards the companies, providing the needed support to them. Most of the University staff have never worked in the (real) economy.

Industrial design is also perceived as important, as a complementary activity, but there are neither schools nor professional service providers in this area.

Automotive, construction and transport are related industries to the metal industry. Transport is perceived as one of the most important related industries. Most of transport is performed using truck trailers. Railway network is not enough developed and the price of their services are higher than the price of truck transportation. Machine building industry is not existing at the moment, even though this is an important metal industry segment.

4.4 Demand Conditions

In the selected value chain, industrial buyers are more demanding than households. All industrial buyers have specific problems and requirements from producers, so every solution must be tailored according to their needs. That is challenging but it is also a basis for learning and development. Buyers from the EU are usually more demanding than the local ones. Sometimes it happens that customer change product requirements (specifications, performances etc.) during design or even production process, so the company must be flexible and capable to make these changes and to satisfy customer. These processes are very "painful" but companies' capacities are strengthened that way.

It is important to notice that there are no many demanding customers, so the "pressure" for further improvement is much more generated by the competition than by demanding customers.

Also, it is important to notice that domestic (BiH) market is relatively small for standardized products which can be produced in big series, so domestic companies must export their products in order to decrease their costs and increase profit (the economy of scale). Prerequisite for export is that every product must meet defined standards (e.g. CE mark). All producers of hydronic heating boilers have the CE mark for their products and export them in the EU countries.

5. Firm Level - Competitive Pressures within the Value Chain

Rivalry

Producers of hydronic heating boilers in the selected value chain, perceive, as the main competitors in the category of hydronic heating boilers up to 250 kW (aimed at households), the following: Termoflux, Jajce, BiH (perceived by Topling doo); Topling, Prnjavor, BiH (perceived by Termoflux doo); Kovan, Gračanica, BiH; Centrometal, Croatia; Termomont, Serbia; Radijator, Serbia and Buderus, Czech Republic.

Topling doo, as the only producer of hydronic heating boilers over 250 kW (aimed at industrial buyers), perceives as its main competitors the following: Herz, Austria; Unicomfort, Italia and Kolbach, Austria.

Procesna oprema doo, producer of stainless steel water heaters, perceives as its main competitors the following: Inox prerada, Serbia; Elit inox, Serbia; Termorad, Serbia and Rankom, Serbia.

So, it can be concluded that the most competitors are from BiH (local competitors), Serbia and Croatia. In the "industrial segment", all the competitors are from EU.

Companies agrue the key advantages over competitors in the "households segment" to be better quality of products, clear vision, determined management, better productivity, competent employees. In the "industrial segment", the key advantage over the EU competitors is the delivery of products, which have the same efficiency as competitors' products, but are simpler and have lower price.

Companies argue the key weaknesses over competitors in the "households segment" to be the problems in development of new products (caused by the lack of competent engineers) and a higher price (though the quality is also higher). In the "industrial segment", the key weaknesses over the EU competitors is equipment related to automation of the entire work process related to hydronic heating.

The key advantages of producers of stainless steel water heaters are better aftersales (service) and lower price in comparison with some competitors (e.g. Elit inox from Serbia). The key weakness is the lack of working capital, which could be used to improve sale conditions towards retailors.

Generally, there is no cooperation and coordination between producers in the selected value chain. There is perception that cooperation might be established in the supply related activities, but not in sales related activities.

The situation in regard to cooperation between the metal industry companies in general is similar. Co-operation exists only between a relatively small number of companies, and it is usually in the domain of product development, procurement of inputs from suppliers, purchasing materials from another producer, production services for another producer/competitor, renting of qualified human resources and equipment.

New Competitors

One of producers of hydronic heating boilers only perceives one new competitor (Lafat komerc from Kalesija, BiH), who has made copies of their products and is producing them now with lower quality and offering them at a lower price.

The producer of stainless steel water heaters does not perceive any new competitor on the market.

Threat of Substitute Products

There are some substitute products or technologies. One of them is co-generation. Co-generation is a mixture of two technologies for heating and producing electric energy, e.g. mixture of solar heating technology and production of electric energy. Alternative solutions are present, but local producers monitor the situation and may develop such solutions and respond to market demand. Also, it is possible to offer very specific solutions in the area of burning bio-mass, such as heating system that burns biomass from orchards and vineyards, as well as bio-mass from kernel of fruits (plums) as fuel.

One of the substitute product is also heat pump, but that technology is very expensive and it can be used only by households with underfloor heating. So, because of the price and demanding technical requirements, there is quite a small market potential for this product/technology.

Also, there are some technical changes and/or demand changes that affect product´s competitiveness. For example, there is automated management/control that improves management of hydronic heating boilers and improves boilers' construction to improve exploitation of boiler (boiler cleaning, etc.). Also, it is important to mention improving design and introduction of modern technologies, as well as introduction of new fuels and meeting the strict EN norms/standards.

Gas is not perceived as an attractive substitute. In Serbia and Croatia (in these countries there is developed infrastructure - gas pipelines), there is a significant number of consumers that are giving up gas heating and switching to pellet or wood as cheaper sources of energy. There is no adequate infrastructure in BiH (gas pipelines) and its installation is very expensive in comparison with the number of consumers (market potential). That is especially characteristic for small settlements. The price of gas is also raising. It is believed that biomass and wood (farms of special, quickly-growing threes e.g. poplars, willows, etc.) have great perspective because of the price and environment.

Substitute for stainless steel water heaters are enameled boiler heaters. Their quality is lower, but their price is also lower (for almost 50%).

Perception of some retailors is that producers of hydronic heating boilers are not fully aware of substitute technologies/products and that their current technologies/products may become obsolete in the future.

Suppliers

Almost all input materials and products come from the Western Balkans or EU countries either directly from their producers or, more often, via local and international distributors. All suppliers that buy input materials directly from big international producers[1] have problem with bad treatment because of the perception that BiH (and all companies from BiH) are highly risky for doing business, so they have to pay in advance or to provide expensive bank guarantees. Of course, that has negative influence on competitiveness of their offer towards domestic producers. It takes many years to gain confidence of these producers and to get more favorable sales conditions. That is way most of suppliers are quite indebted and their liquidity is often threatened. It should be emphasized that there are no producers of sheet metal and other products in BiH which are used in production of hydronic heating boilers and stainless steel

1 For example, the most important producers of sheet metal are: Marcegaglia and Beltrame steel from Italy, Dunafer from Hungary, Duferco from Switerland etc.

water heaters. There is only steel and iron producer, Arcelor Mittal from Zenica, which produces different metal products for construction industry.

Speaking about bargaining power, if the supplier is a big international producer (e.g. US Steel, Kosice) and the buyer is our local producer, then the supplier is dominant, because the quantity sold to our local producer of hydronic heating boilers is very small in comparison with his total sale. Vice versa, in case that our local producer of hydronic heating boilers is one of the biggest buyer to some supplier (e.g. some small distributor), than the local producer of hydronic heating boilers has a dominant position and bargaining power.

In cases of more complex products e.g. automatic control system, engines, etc., suppliers offer relevant support and technical advice.

Buyers

In the segment of hydronic heating boilers up to 250 kW (intended for households), the main buyers are retailers, which are local companies (e.g. Economic from Vitez, Teh San from Banja Luka, Vokel from Posušje etc.).

A significant part of hydronic heating boilers for households is exported, mainly to the EU countries. Retailers on foreign markets were usually found at fairs (e.g. Frankfurt, Milano etc.). Our producers are exhibitors at such fairs and that is an opportunity to contact potential retailers and talk about potential cooperation.

Hydronic heating boilers over 250 kW are sold to industrial customers from BiH, Croatia, Italy, France, etc. It is important to emphasize that more than 50% of industrial customers are demanding. Thanks to the team (professional staff), our leading producers can meet expectations of these customers, but the prices of adjusted solutions are also higher.

In the segment of hydronic heating boilers for households, specific requirements (e.g. fully automatized boilers, or boilers with big tanks) are not common, so adaptation of standardized products could be done but its price would be much higher and therefore unacceptable for customers. That is the reason for producing only standardized boilers that meet expectations of most customers, at an affordable price.

In the segment of up to 250 kW, with approximately 50% buyers, there is a contract with defined dynamics of delivery, while the other half makes orders when needed, after selling the products they have on stock. In the segment over 250 kW, everything is defined by the contract.

Speaking about bargaining power, in the segment up to 250 kW, in most cases buyers (retailers) are dominant. It is possible to improve bargaining power by strengthening the marketing. Competitors also have a very strong influence on actions. On the other hand, in the segment over 250 kW, producers are dominant, because this segment is about projects that require a high level of knowledge, professionalism, adjustment etc., and it is therefore possible to make influence on the prices and terms of delivery.

6. Meso Level - Supporting Institutions

Institutions mentioned by the companies are ministries that provide subsidies, Chamber of Commerce, Foreign Trade chamber and municipalities. A lot of companies perceive their support more declarative than real. But in spite of that fact, expectations from companies are still quite high (especially support provided from the state level).

Companies as significant support perceive subsidies for export-oriented companies located in the Republic of Srpska, provided by the RS Government of Industry, Energy and Mining. The Ministry supported 285 export - oriented companies with KM 19.6 million in 2013 (all producers from the selected value chain were supported) (Ministarstvo industrije, energetike i rudarstva, 2014). Some producers got subsidies (around KM 4000) from the same Ministry for introducing quality standards a few years ago. Also, the same producer got financial support from the RS Agency for Development of SMEs for buying some welding equipment 5 or 6 years ago.

The Institute for Standardization of B&H proposes the strategy of standardization in B&H, prepares and publishes standards of Bosnia and Herzegovina, represents and acts on behalf of Bosnia and Herzegovina in international, European and other interstate organizations for standardization, and performs other tasks that originate from international agreements and memberships in the organizations. It participates in preparing technical regulations, develops and establishes the information system of standards of B&H, organizes and carries out specialist education of personnel in standardization area. It is engaged in issuing-publishing activities for standardization area (Institute for standardization of B&H, 2014).

It is important to mention that the Ministry of Foreign Trade and Economic Relations (according to the "Law on Technical Requirements for Products and Conformity Assessment", 2004), is responsible for the appointment of certification bodies, which are responsible for resolving the issues of using the mark of compliance in accordance with the relevant technical regulations for products. So far, unfortunately, this Ministry has not appointed a single certification body in Bosnia and Herzegovina, even for our domestic needs. B&H has not adopted any directive that regulates the use of the CE mark. The right to use the CE mark can be obtained only by a manufacturer whose product has been certified by an internationally recognized certification authority (such as TÜV-Germany, for example). Also, in most cases, for exporting products the companies must obtain certification abroad to demonstrate compliance with the

regulations of the country of destination. The weakest point in this area is the lack of a proper conformity assessment infrastructure in BiH – testing and calibration laboratories and certification bodies.

Although legislation is in place for the BiH accreditation system to be internationally accepted, and therefore conformity assessment bodies to be accredited in BiH, there is a lack of technical implementing regulations that are EU-aligned. The outdated ex-Yu technical regulations that are in force in BiH are non-harmonized national standards, so there is little interest or economic incentive to obtain conformance assessment accreditation for them. As a result, the BiH companies must often engage foreign consulting companies and certification bodies to implement standards. Many certificates issued by local BiH bodies are at present not internationally recognized. Foreign conformity assessment can be a financial burden. However, the extent to which BiH should build its own conformity assessment resources is an open one (FIRMA, 2010, p. 23).

Mission of the Institute for Accreditation of B&H, BATA, is establishing and maintaining a competent, objective and independent accreditation system, so that users of services of accredited bodies and the consumers in Bosnia and Herzegovina may have trust in the services provided by laboratories, certification and inspection bodies. Accreditation represents the formal approval that a conformity assessment body (laboratory, certification or inspection body) is competent to conduct conformity assessment activities according to internationally recognized rules. Accreditation ensures confidence in testing, calibration, certification and inspection results and represents proof of competence of testing and calibration laboratories, certification and inspection bodies. Accreditation also ensures international recognition of validity of these results and creates conditions for free movement of goods, services and persons (Institute for Accreditation of B&H, 2014).

Local administrations can also influence significantly on local ambient for business. Most companies are indifferent towards lightly dissatisfied in regard to their respective local administration – quality of local infrastructure and public services. Lack of communication between companies and local administrations is evident in most local government units.

There are two relevant faculties within the project area – the Faculty of Mechanical Engineering in Banja Luka and the Technical Faculty in Bihac (Mechanical Department). Within the Faculty of Mechanical Engineering in Banja Luka there are 14 laboratories:

- Laboratory for design supported by computer - Computer center of the Faculty of Mechanical Engineering,
- Laboratory for integrated management systems
- Laboratory for plasticity and processing systems
- Laboratory for design of technological processes by using computers - CAPP (Computer Aided Process Planning)
- Laboratory for energetics
- Laboratory for machinery dynamics
- Laboratory for automation and mechanization – LAM
- Laboratory technology of cutting and processing systems
- Laboratory for hydraulics and pneumatics
- Laboratory for measurement technique
- Laboratory for engines and vehicles
- Laboratory for mechatronics and robotics
- Cooperative training center
- Laboratory for cooling technique (Mašinski fakultet Univerziteta u Banjaluci, 2014).

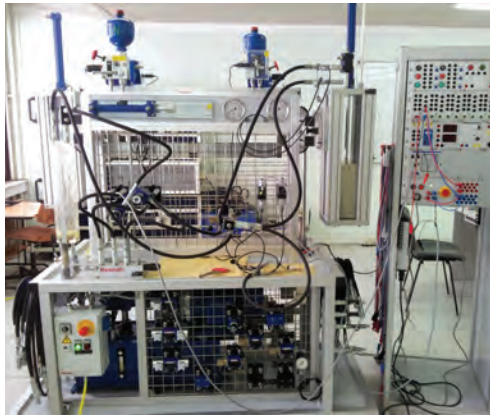


Figure 4 - Laboratory for hydraulics and pneumatics

Figure 5 – Training centre for welding

Figure 6 – 3D printer

Faculty of Mechanical Engineering in Banja Luka has recently got a lot of new equipment. Among others, the following technology and equipment is available at the faculty: rapid prototyping, (2 generation), 3D printing - cooperation with medical research, use of composites materials, design platforms (CAD, SOLIDWORKS, CATIA, CAM), design for manufacturing. Also, there is software for manufacturing simulation, searching for the best process design. Focus in teaching is on materials flows, so there is significant space for improvement in industry, but the problem is that firms often do not have people who can use this technology.

Speaking about the secondary level of education, there are Technical school in Banja Luka and Mechanical-Transportation Mixed Secondary School in Bihać. Within mechanical engineering - metal processing department, there is education for the following occupations: mechanical technician, installer, locksmith, processor of metal by cutting and car servicer (Tehnička škola - Banja Luka, 2014). Within Mechanical-Transportation Mixed Secondary School in Bihać, there is education for the following occupations: mechanical technician - programmer of CNC machines, mechanical technician for computer design, technician for road traffic (4 year education), driver of motor vehicles, car servicer, installer of central heating systems, plumber, locksmith, operator of construction and cargo machines (3 year education). Most of the workforce in producers was educated by these schools, but with additional training for welders provided by faculties (JU Mašinsko-saobraćajna mješovita srednja škola Bihać, 2014).

7. Macro Level Framework Conditions

There are both positive and negative impacts of framework conditions. Example of positive impact can be found in the Federation of BiH, where export – oriented companies are supported by stimulant fiscal policy. Namely, all companies who export more than 30% of their total sale, do not pay income tax. In the Republic of Srpska, income tax is 10%, in Croatia it is 20% + additional taxes for income transfer, etc. This is one of sources of financial advantages that have companies from the Federation of BiH in comparison with other the competitors outside of the Federation of BiH.

But there are also some negative impacts of the framework conditions. For example, negative impact comes from the fact that the BiH, as a state, has not accepted EU regulations and directives with regards to technical conditions and characteristics that products must meet. Almost all our producers fulfil the above norms anyway (because large portion of their production is exported to the EU), while, on the other hand, low quality products are imported to BiH that do not meet the above-mentioned norms/standards. These products are cheaper and they take a significant market share. So, BiH regulations should be harmonized with EU technical norms/standards as soon as possible. Also, the Labor Law is not flexible. There is especially a problem with sick leaves. Only the first month of employees' sick leave is financed by the state/entity, but any further period (the second, the third month, etc.) is financed by the company and 70% of that cost is refunded by the entity. But the entity is late with that payment, they become a debtor to companies, and there is no possibility for clearing with the entity. Similarly, there is no possibility for (multilateral) compensations with the companies abroad (a special permissions from relevant ministries must be obtained).

Courts are quite slow and inefficient.

8. Meta Level

Speaking about the meta level (the system of values, social capital, social cohesion, collective memory, etc.), which influence all other previously mentioned levels (macro, meso, company level), the following should be mentioned:

- Low level of communication and trust between producers and between people in general;
- Generations of youth without work habits - they "wait for" a job instead of "searching for" it. But also, there is no opportunity for the first job (the economy is small). Low level of practical knowledge - education is too general and academic, often obsolete, without orientation on solving real life problems;
- (Negative) politics, instead of business and real life, is a common topic on the media and between people in BiH. Via media, people are "hypnotized" and kept in constant subconscious uncertainty and fear. People are oriented towards the past instead of towards the future;
- There are some positive stories and successful cases, but most media are not interested to publish them;
- Envy in the case of the success of others.

9. Key Gaps Identified

Having in mind all previous findings, the following gaps can be identified:

1. Gap between international leading companies and domestic producers
There are many gaps within (general) gap between international leading companies and domestic producers, but the information and knowledge gap could be the most important:

- Information gap - some domestic producers are not aware of new technologies that the leading companies develop and use, as well as of launched new products that are based on new technologies,
- Knowledge gap – the leading companies are source of R&D and our companies try to follow them. But there are no adequate centers or nodes for technology and knowledge transfer that could facilitate that process.

2. Gap between small domestic market and big international market

- Domestic market for most products is small because of a small number of inhabitants and low purchasing power. On the other hand, in order to be price competitive (to achieve economy of scale) and to use machinery efficiently, domestic companies must be export-oriented. In order to export, producers must fulfill specific technic requirements (e.g. the CE mark) and find customers (needed marketing knowledge).

3. Gap between quantity and quality of available and needed human resources

- There is a deficit of mechanical engineers. Between 5 and 10 engineers per year usually graduate from the Faculty of Mechanical Engineering in Banja Luka. Around half of them find jobs in the EU countries. Knowledge of pupils after secondary education is not satisfactory. Practical knowledge and skills are missing, so the companies must organize internal trainings for them.

4. Gap between production and marketing mindset and orientation of producers

- In many cases, directors of companies are engineers, who are focused on technology/machinery, while the market (and marketing) is often neglected. Many companies are passive towards potential customers – they are waiting for customers to find them. There are only a few companies, who have a marketing department or an employee whose job description is marketing (market research, database marketing, promotion, customer relationship management etc.).

5. Gap between existing and needed financial funds

- Most companies have problems with payment of their receivables, and they struggle to keep their solvency. So they do not have financial funds for investments, especially in R&D projects – new products development.

10. Summary of Main Findings

The main findings are closely related to the famous quotation of Peter Drucker: "Business has only two functions — marketing and innovation. Marketing and innovation produce results; all the rest are costs". The weakest areas of our companies are exactly marketing and innovations. Probably, that is one of the most important causes of current situation in the metal industry. Most of our companies are focused on production, while marketing and innovations are neglected. These functions are underdeveloped or do not exist. On the other hand, most investments are focused on equipment and machinery, although without innovations and marketing, they cannot be used effectively (that happens quite often). The Little Prince[2] would say: "What is essential is invisible to the eye…". Machinery without innovations and marketing is useless. Also, it is important to mention that both quality and quantity of human resources should be improved (engineers, technicians, welders, etc.)

2 The main character of the book for children written by Antoine de Saint-Exupéry.

11. Main Recommendations

11.1 Improvement of Business Operations at a Firm Level

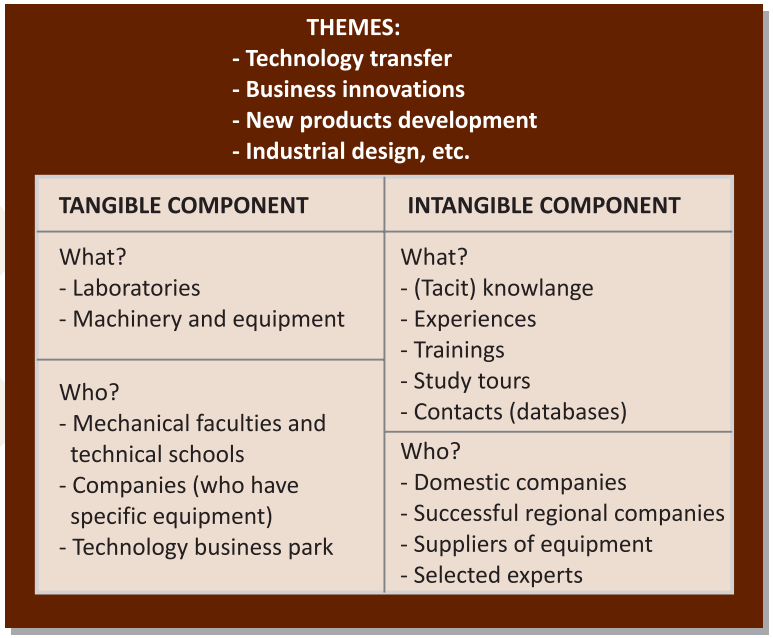
The main instrument would be a call for proposals aimed at co-financing of firms' investments. Also, training on innovations and its application for directors/owners of companies will be held in order to support internal capacity building.

Especially support should be provided in regard to product development (design, technical preparation, 3D printing etc.), as well as in regard to marketing support (market research, database marketing, promotion, customer relationship management, etc.).

11.2 Industry Wide Interventions

Having in mind the findings mentioned before, it is clear that one of the most desirable interventions would be with regards to improving R&D capacities of domestic companies. Most of them do not have enough resources to establish these functions internally (and that would not probably be rational), so it is desirable to establish some kind of a R&D center, whose services would be used by all interested companies. The Faculty of Mechanical Engineering in Banja Luka has recently got a lot of new equipment, so it may have a significant role. A significant part of that equipment is used only for educational purpose (students' practice) and most of the time it is not used at all. Also, the companies are not informed about the equipment (partially because of the fact that the Faculty has got it recently), so there are no requests for using it. Another important role of the R&D center could be (practical) education, retraining and transfer of (tacit) knowledge, experiences, information and possibilities for B2B contacts and networking. This "intangible" part of the R&D center is perhaps an even more important than "tangible" part of the center with equipment, machinery etc.

Figure 7. Concept of R&D center



R&D center should be complimentary to supporting the firms to start a process of joint R&D. To make this work, the firms must be very specific about what kind of things they want to work on. (Maybe an appropriate example may be in the case when one firm produces a product, and another company uses that product as an input for its more complex product). R&D center should offer services, which could be attractive for most manufacturers – e.g. product design (using specific software), simulation of production, 3D printing etc. There is assessment that around 50 manufacturing firms (metal processing, plastics, textiles) would be able to benefit from the center.

11.3 Interventions Aimed at Meso Organizations

During the research it was found that there are few meso organizations relevant to the industry and that they are far distanced from the direct needs of the industry. At the same time, the industry only recognized support in the form of direct subsidies and grants. Thus, the communication and cooperation between the firms and public support organizations were weak.

The fieldwork identified several issues that should be addressed by organizations at the meso level. *Eda* will work with the industry to explore and formulate opportunities to work with selected public support organizations to introduce improved services and to strengthen the cooperation between the industry and the meso level.

Eda is working closely with development agencies and municipalities already, and we will share the findings with these organizations to support them to develop more specific support and service offerings to the industry. Where meso organizations are disconnected from the industry, we will support a process of closing the gap between the organizations and the industry. Thus, *Eda's* role would be that of a mediator acting on behalf of both industry and public support organizations.

11.4 Policy Recommendations

Amendments in relevant law and bylaws are needed with regards to:

- Payment system – the state/entity can be late in payment towards companies, but vice versa is not possible. The state/entity and private companies should be equal in terms of mutual payments. Now, the public sector is a significant source of insolvency, which is transferred to private sector.
- Income tax - In the Republic of Srpska income tax for export-oriented companies should be the same as in the Federation of BiH – 0%.
- Regulations and directives in regard to technical conditions and characteristics that products must meet – BiH, as a state, has not accepted EU regulations and directives in regard to technical conditions and characteristics that products must meet.

In regard to defined weak areas, policy analysis should be performed and defined solutions should be communicated towards opinion-giving leaders and decision makers.

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13. Annex

Value Chain for Hydronic Heating Boilers and Stainless Steel Water Heaters