INNOVATION THROUGH CRAFTMANSHIP

Abstract: *The following article points out – emanate from the description of the importance of the craft in Germany – how the topic innovation management and innovation processes can be depicted for the craft and which requirements arise for these companies. Thereof the area of strategy alignment for the craft can be derived. Using the example of a typical craft enterprise, the impact of innovations will be turned out. Based on the expected price development of fossil fuels, the article deals with which input renewable energy sources contribute in the future and what consequences, challenges and opportunities for innovation result for craft companies in the plumbing, heating and air conditioning branch.*

Keywords: renewable energy sources, innovation management, innovation process, crafts sector, Germany.

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1. The importance of the crafts sector for technical development

The new publicity campaign of the German crafts sector indicates the capability to which craftsmen are able to generate innovation performance: Even though the extrapolation of the results of the "Prognos-Study" initially suggests that half of all 970,000 German crafts enterprises regularly create innovations (Kentzler, 2006), such a forecast surely does not quite fit reality and leads to a wrong impression - that there is no need to foster innovations in the crafts sector. This, however, is not the case. Irrespective of the fact that the crafts sector normally generates routine and improvement innovations rather than basic innovations, those numbers clearly and impressively prove the relevance of the crafts sector for the German innovation process. Innovative businessmen are the engine of technical, economic and social progress and a timely introduction of modern technologies represents the essential competitive factor for a national economy (Staudt, 1986).

Innovations do not make their way into a market economy if or because they are technically feasible or socially desirable, but only when they are considered economically reasonable. Their practicability on a micro-level and, hence, their application are essential. Only a successful implementation on the market, the adaptation by the customer, leads to economic success and, thus, to the introduction of the respective technology (Bock, 1987). The customer's willingness to use and apply (technical) innovations requires that they can be installed, maintained and repaired. This means that an infrastructure has to be developed and made available, which ensures this as smoothly as possible. Here, the crafts sector takes over a multiplication function and allows for the establishment of new products on the market (Prognos AG, 2006).

What would new technical developments such as electronic cars be without repair and service facilities; solar thermal systems, which use renewable energies and increase energy efficiency, be without the availability of installation and maintenance enterprises; energy-saving sanitary facilities to minimize energy and water consumption be without the existence of sanitary enterprises. Those examples already suffice to indicate the importance as well as the responsibility that the crafts sector has to take over – and does take over – in the field of our economy's (technical) development. Therefore, the title of this article "Innovation through Craftsmanship" was chosen deliberately, because the crafts sector plays the role of the multiplication that, at the same time, can act as an innovator. In between those roles, crafts enterprises take over various functions on all different levels of value creation (Prognos AG, 2006).

2. Innovation management and innovation processes in the crafts sector

On the microeconomic level, this leads to an enormous challenge for the individual crafts enterprise and, thus, for the master craftsman, who – as a businessman – has to bear all the risks. He has to constantly question himself what

kind of products and services will help to acquire and convince new customers while helping to keep existing ones. Depending on the kind of risk that has to be taken, different types of innovators can be defined. In this respect particularly the electricity and metal industries are characterized by a strong potential for innovations but also by a high pressure to innovate. Moreover, the willingness to innovate is determined by the businessman's personality and his/her willingness to deal with changes, his/her professional education and the size of the business (Loher, 2006). As regards the contribution to technical change within an economy, the "Volkswirtschaftliche Institut für Mittelstand und Handwerk" at the University of Göttingen distinguishes between the following types: traditional enterprises, service innovators, technology-based niche-suppliers, and technical problem-solvers for industrial employees, radical innovators (DHI, n.d.). It has to be noted that type affiliations can change and that craftsmen can be assigned to more than one type.

The particularity with innovation management in the crafts sector is that – due to the sizes of business enterprises – in most cases management of innovations is done by the owner of the enterprise. The entire innovation process (Bischof, 1976) including brainstorming and evaluation, research as regards best available technology, registration of property rights, consideration of support programs, development (technical concept, prototype), production/technical realization, implementation on the market and the participation in innovation competitions lies with the owner of the enterprise. This is why he is the fundamental key to answering questions on whether and how to deal with changes. Surely, in medium-sized and bigger crafts enterprises also employees and their competencies play a significant role in this process, nevertheless, the owner is likely to be the driving force of innovation.

3. Scope for innovations in the crafts sector

The owner of a crafts enterprise needs to treat different existing fields of innovation (especially information, qualification, financing, cooperation and organization/legal form) with varying intensity, depending on the type of innovator he is.

3.1. Information

Organizational theory emphasizes the free flow of information and communication both within and outside the organization as a determining factor for innovative activities. In industrial enterprises the department of Research and Development (R&D) does have a key role. It has to solve problems for specific tasks and/or provides the enterprise with knowledge – independent from current market requirements (Staudt et al., 1990). In big industrial enterprises, the information and communication flow is structured internally through R&D, strategic corporate planning, market research or the staff department. Compared to this, innovative

activities carried out by smaller crafts enterprises require another form of information retrieval and, thus, also a different way of organizing information.

In the crafts sector it is essential to discuss how to organize a regular flow of information and how to assure that the managerial decision-maker receives the required information regarding the organizational environment. This means, that information concerning best available technology (patent research, specialist literature, trade fairs, and congresses) and market and sales potentials (market and customer analyses) has to be made available. Apart from obtaining all relevant information, the decision-maker has to anticipate possible development processes in the political, economic, social, technological, legislative and ecological environment.

In this context the literature also uses the term “barrier of not-knowing” which has to be demarcated from the barriers “lack of ability” and “lack of permission” (Loher, 2006, p. 8). Due to personnel and financial restrictions, crafts enterprises have to outsource this function or their staff departments. They are, hence, more dependent on external information providers such as trade associations, relevant Guilds of Craftsmen, Chambers of Crafts offering business, technology and marketing advice; customers, producers, universities and other research institutions, intermediaries etc. (Staudt et al., 1992). As regards innovations it is therefore essential that smaller crafts enterprises are willing and open to make use of the products that externals offer them with respect to information and communication.

3.2. Qualification

To create something new and to make the innovation applicable requires particular competences – not only in the crafts sector. An agreement between the German federation, all federal states as well as social partners led to the equalization of the Bachelor degree and the master craftsman degree (level 6) on the ranking list for school graduation and training qualification – the German Qualification Frame (Deutscher Qualifikationsrahmen DQR). This has led to an increasing importance of the degree “master craftsman” in the context of comparing international degrees. The qualification achieved through craftsman training and business management courses in the crafts sector form a solid fundament for dynamic development processes of new technologies.

Moreover, it is vital to promote the further development of enterprise-specific competences of both entrepreneurs and their employees. To achieve this, formal qualifications obtained through advanced training or crafts academies normally do not suffice. The dynamic development of new technologies requires an equally dynamic adjustment and further development of own competences of the entrepreneur and all employees. In order to be able to use the options of new technologies for the development or stabilization of the crafts enterprise, the entrepreneur has to invest in further training for employees.

Moreover, the entrepreneur has to provide "free" time frames in which he and his employees can attend seminars, manufacturer trainings, evening classes, etc. "Free" time frames are also required to organize internal further training as well as the internal transfer of know-how. Also in this context it is important to think about the sources of information that can be used. Normally, small crafts enterprises do not have a department for personnel development and training which is why the entrepreneur has to make use of external information sources, in order to overcome this "lack of ability" (Loher, 2006, p. 12) barrier.

An amendment of existing competences can be achieved by fostering the cooperation with universities (see area of cooperation). Whether there are business or engineering-related questions, practice-oriented Bachelor's or Master's theses or internships can help to specifically deal with entrepreneurial problems and to work on solutions. The Bachelor and Master job board provided by Bochum University of Applied Sciences supports the added value of a close link between economy and science. It has been in existence for some time and is operated in cooperation with the Chamber of Industry and Commerce for the Middle Ruhr Region and the Chamber of Commerce in Dortmund. Further approaches are joint events, company visits or the joint organization of company seminars or innovation workshops aimed at dealing with selected (engineering-oriented) problems.

3.3. Financing

In view of the fact that the average crafts enterprise has five employees (Bock, 2011), this raises the question of how to finance innovative projects. How can a crafts enterprise take precautionary measures that facilitate the generation of innovations out of the existing?

A prerequisite for this will be that the enterprise first has to understand its traditional business – the status quo. Based on this, it can further optimize, rationalize and identify as well as benefit from continuous improvement potentials. The more the entrepreneur is able to manage this business, the more freedom he has to create innovations. However, financing problems often make it difficult to implement innovative ideas, also in crafts enterprises. Financing problems lead to the fact that required personnel is not used and that product developments are not actively pushed forward (Prognos AG, 2006). Nevertheless, innovation requires the willingness to bear risks and it needs to be calculated, which risk appears entrepreneurially acceptable.

As regards the aspect of financing, it surely has to be analyzed in how far innovative projects can be financed with subsidies from the federal state, the state or the EU. However, this frequently overburdens the crafts sector, which is dominated by small-scale businesses: While bigger enterprises have in-house specialists that handle such programs, in small crafts enterprises it is the owner who additionally has to deal with directives for business promotion and – often complex – application procedures, particularly with respect to EU-programs. Thus, it is not surprising, that crafts

enterprises are underrepresented as participants and prize winners in innovative, technological and technology-transfer political competitions. They are, hence, "[…] only very insufficiently involved into the structures and programs of the federal IT policy" (Loher, 2006, p. 5). In this respect, particularly the know-how of crafts association structures, the technology-transfer consortium, but also of banks, university intermediaries and universities as such should be recalled.

3.4. Cooperation

Cooperation represents a type of external growth for crafts enterprises. The legal and economic autonomy of all participating parties is maintained and there is the option to overcome scale-induced disadvantages by bundling resources on a voluntary basis. As a result, this type of inter-organizational cooperation leads to advantages in terms of risk, cost, potential and profit generation (Staudt et al., 1992). To achieve this, it is necessary to find suitable partners and to organize the cooperation. Starting points for cooperation can be found in almost all business units. With respect to innovative projects particularly the departments of procurement, sales (distribution/advertising), education and further training (in-house training), production/order processing, but also applied research and development are important (Staudt et al., 1996, p. 12).

Three ways of cooperation can be distinguished (Staudt et al., 1992, p. 4f): horizontal cooperation (association of partners of the same branch); vertical cooperation (association of partners of consecutive value-creating steps); complementary cooperation (cooperation of partners from different disciplines, branches, industries). Due to the fact that crafts enterprises – different from industrial enterprises – normally do not possess their own R&D department, a close cooperation with universities of applied sciences in the area of R&D turns out to be appropriate. These universities focus on an applied research and development and frequently are on the same wavelength, both linguistically and mentally.

The documentation on the prize for innovation partnerships 2008, for instance, shows the bandwidth of cooperation between crafts enterprises and universities: semi-automated engine for mobile partitions, miniaturized ceramic detector for gas chromatography, fully-automated wire-grid straightening machine, robot for the cleaning of slatted floors.

Ungermann's (2012) article shows another example for a successful cooperation. He shows how and where mutual collaboration is possible within a cooperation and how different competences can be combined. Actually, an essential prerequisite for a successful cooperation is that everyone involved has and contributes with specific competences. Moreover, the cooperation partner should be of approximately the same size to allow for an equal partnership (which, in this form is, of course, not given with respect to university cooperation). This type of cooperation needs to further be intensified – especially with respect to the innovation aspect. Existing formats, such as the Technology-Transfer-Association for the crafts sector

(Technologie-Transfer-Ring-Handwerk) or the Innovation Association in Crafts (Innovationskreis Handwerk) should be used more intensively. Surely, there are still enormous – up to now idle – potentials.

Even though design possibilities and application areas are various, there are limits to cooperation between enterprises. Cooperations are able to compensate for resource deficits and disadvantages in terms of size, however, they never replace missing entrepreneurial skills nor do they exclude entrepreneurial risk. A cooperation between two weak partners will, thus, not result in a stronger position (Staudt et al., 1992).

3.5 Legal form/organization

Innovation involves risks, leading to the question as how far the choice of organizational structure and legal form helps to limit occurring risks. Normally, crafts enterprises are founded as non-incorporated firms, thereby being functionally organized.

The trade register of the Chamber of Crafts in Dortmund shows the following distribution regarding the choice of legal form of approximately 20,000 enterprises for the years 2007 and 2011:

Table 1

Dortmund Chamber of Crafts – statistics from 2007-2011

Legal form	2007	Percent	2011	Percent
Sole owner	13,532	68.47	13,711	69.67
One-man business	755	3.85	658	3.34
oHG	115	0.59	89	0.45
KG	96	0.49	78	0.40
Gmbh & Co. KG	661	3.37	622	3.16
GmbH	3703	18.68	3647	18.53
AG	19	0.10	22	0.11
GbR	768	3.91	658	3.33

As far as liability aspects are concerned, it can indeed make sense to convert the non-incorporated firm into a joint-stock company and to organize the enterprise by objectives (disciplines, products, services) instead of functions.

Bigger enterprises have recently tended to split their divisions into legally independent units. This is referred to as a so-called holding model. All single units are legally independent. They are led by a head office normally as a contractual group (Müller-Stevens and Lechner, 2011). In a so-called “Operative Holding”, the head office is in charge of both the strategic as well as the operative management. Applied to a bigger crafts enterprise, this could mean that property ownership, buildings, commercial services, individual disciplines/systems are being integrated into legally independent enterprises, without risking that the entrepreneur loses command over operative management activities. Particularly with respect to very innovative projects, this is an option to reduce risks.

4. The successful crafts entrepreneur?

In his book "Hidden Champions", Herman Simon (2007, p. 46) determined the characteristics of successful companies. This surely can be applied to successful crafts enterprises. Amongst others, he mentions: ambitious objectives and strict management, motivated and competent employees coupled with mutual trust, trust in own strengths, an extremely high degree of customer orientation. In total, this is supposed to lead to a high innovative potential.

Nevertheless, innovation management in the crafts sector further requires a detailed analysis of the organizational areas illustrated: information handling, developing required competences, using cooperation options, securing financing and a further development of the chosen legal form provide development potentials for innovative craftsmen.

Innovations in the crafts sector are diverse and vital for the enterprise. Stagnation or mere administration of the existing know-how means regression. The entrepreneurial success in the crafts sector is measured by expert knowledge, quality and customer satisfaction. Successful craftsmen think in terms of solutions. They competently and creatively put ideas into practice. This requires high professional skills and creative capabilities, which are both acquired through in-house apprenticeship and training centers for the crafts sector (DHI, 2011). Managing the existing know-how through optimization and improvement on the one hand and the design of something new in terms of new products/services/markets – finding a balance is the key to successful business management – also in the crafts industry (Benningsen-Foerder, 1988).

5. Practical design of innovation management – an example from the field of sanitary, heating and climate

5.1. The Hasenkamp enterprise

The innovative crafts enterprise Hasenkamp is a family-owned traditional business that has been in existance for more than 90 years in the area of sanitary, heating and climate technology. With 104 employees, the SHK-enterprise is specialized in complete bathrooms and environmentally-friendly heating systems from a single source. Further fields of action of the comprehensive service portfolio consist in small-scale plumbing and metal techniques, swimming pool technology and gas safety engineering, sewer cleaning, leak testing of waste water plants, temporary heat provision, housing modernization, air-conditioning engineering, lifting platform rental and much more. Every year, the enterprise hires approx. 10 new apprentices. Further training and social programs represent the foundations of the enterprise's personnel work.

The enterprise maintains two bathroom showrooms, honored with numerous awards, in Bochum and Hattingen under the name "Bathroom Oasis Hasenkamp".

Since 2011, the modern energy-saving center “Energy Source Hasenkamp” informs about the latest innovative heating systems for renewable energies. The family-run enterprise considers the environment and business ethics, and also engages in various social projects.

Source: Fachverband Sanitär Heizng Klima, Nordrhein-Westfalen, 2012

Figure 1. **Logo guild sanitary, heating, climate**

Source: C.A.R.M.E.N. e.V., 2012.

Figure 2. **Price development for wood fuels, fuel oil and petroleum gas**

5.2. The status quo

In the future, prices for energy will increase drastically. Hehenberger, futurologist and founder of the "Institute for Marketing and Trend Analyses, intends to answer questions such as: "What happens in Germany in a globalized world? How will we live in 20 years?". As regards the development of energies, Hehenberger assumes that prices for copper, aluminium, platinum and all oil-based products will, on average, increase by 10% annually, whereas prices for renewable raw materials like wood, elephant grass and biomass in the wider sense, will only increase by 5-7 %. The reason for those price increases is, among others, the growing hunger for raw materials in the Asian market, particularly in China and India with more than 2.7 billion inhabitants. Those two countries simply buy up raw materials. In the past eight years alone, the price for crude oil has increased by more than 40 cents/liter (Institute for Marketing and Trend Analyses GmbH, 2009, p. 2).

This also affects the crafts sector. Copper, for instance, has become so "valuable" that on German construction sites, a sheer market for "acquisitive crime" has emerged. Entire construction sites are being safeguarded by surveillance companies to avoid already built-in materials being stolen on the weekends. Due to the sell-out of raw materials it is difficult to calculate the costs the customer is charged with. In North-Rhine Westphalia, this year alone, more than 20 enterprises have been driven to the brink of insolvency because construction projects dragged on and prices could not be maintained anymore due to a lack of material price escalator clauses. Also, a private person cannot avoid the occurring additional cost burdens, making exact and reliable calculations almost impossible.

The price increase for end customers is pointed out in the following example: The ordinary one-family house with hot water supply and condensing boiler heating system, on average, consumes heating energy worth 2000€/year. Within the next 20 years, costs will amount to up to 114,000 €, assuming a 10% price increase per year. Without this increasing price rate costs would amount to only 40,000 €, raising the question of how to save energy.

At the beginning of 2003, the price for crude oil amounted to 0.40 cents/liter, while in 2010 it already was approx. 0.70 cents/liter. As the price for gas is connected to the oil price, also the gas price had increased from approx. 0.45 cents to 0.65 cents in 2010. Thus, both crude oil and gas have been subject to enormous price fluctuations and high price increases over the past years. In contrast, prices for wood chips, pellets and logs have only slightly increased over the years and merely faced extreme price fluctuations (C.A.R.M.E.N. e.V., 2012). Futurologists fear that, from 2035 onwards, crude oil and gas will be (almost) used up. Thus, the dependence on finite resources is a global problem which must be solved in the near future. These developments include incalculable consequences for environment and mankind (see Fukushima 2011). As a result, environment and climate protection have become increasingly important.

Source: Welt online, 2012.

Figure 3. **Nuclear accident in Fukushima**

The Kyoto-Protocol, which entered into force for the first time in 2005, aims at moving forward global climate protection. It specifies that annual greenhouse gas emissions by industrialized countries shall be reduced by an average 5.2 % compared with 1990, within the so-called first commitment period (2008-2012). For emerging nations and developing countries no reduction targets are stated. Until the beginning of December 2011, 193 nations and the EU had ratified the Kyoto-Protocol. However, the USA never signed the protocol and Canada declared its opting out on 13 December 2011. In 2012 the Kyoto-Protocol will end. A second commitment period and its design (including new reduction targets and a validity period until either the end of 2017 or 2020) will be determined at the 2012 UN Climate Conference in Qatar. In particular, the amount and distribution of future greenhouse gas reductions, the involvement of emerging nations and developing countries in the reduction commitment as well as the amount of money remittance, are still controversial. Despite humanly caused environmental catastrophes, a sound and determined course of action is not recognizable. The melting of glaciers, high water and flooding, droughts and other catastrophes deserve urgent attention and active engagement (Wikipedia, 2012).

Cautious attempts to get out of this dilemma are the further development of renewable forms of energy as well as a change of mindset, doctrines and behaviors. State subsidy programs and legally prescribed energy-efficiency standards create a framework that stimulates the market. Also the crafts sector experiences and accompanies this change. A new responsible use of the entrusted raw materials, goods and a conscious study of the entire topic, determine the quality of service and the debate in the crafts sector. A proper sensitivity and a clear mind will enable craftsmen to handle entirely new fields as regards sales and daily business. If there is more

thinking ahead instead of reflecting, this will offer highly interesting opportunities. The crafts sector can clearly benefit because recent developments put quality before quantity, respect before carelessness and individualization of society before global processes.

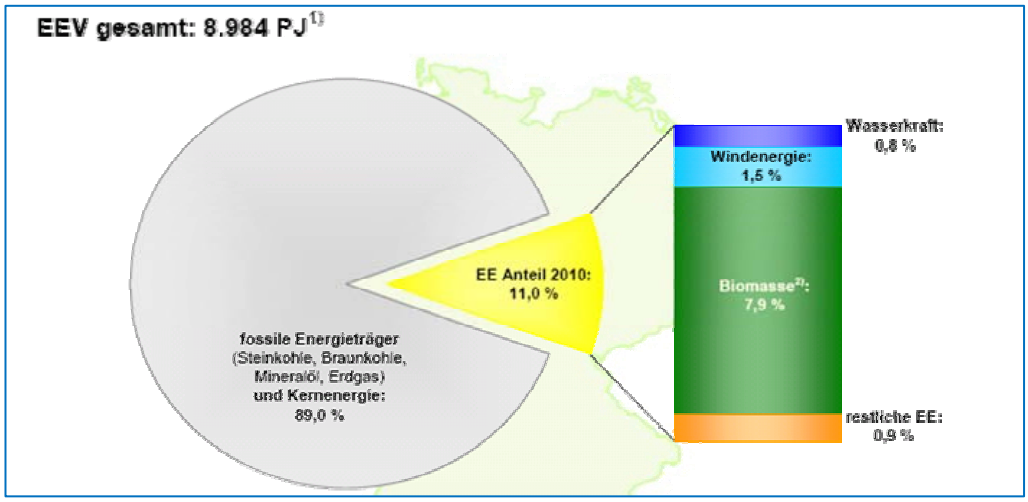


Figure 4. **Share of renewable energies in final energy consumption in Germany 2010 (Energy Environment Analysis GmbH & Co KG; solid and liquid biomass, bio gas, landfill and sewage gas, biogenetic proportion of waste, biofuels; BMU-KII IIII 1 by working group renewable energy-statistics and ZSW, 1PJ=10^15; Use of data by working group energy-balances e.Vb., 2011, p. 4)**

In 2010, the share of renewables in final energy consumption in Germany amounted to 11%, biomass having the biggest share. Moreover, wind and water energy as well as solar energy make a contribution. Compared to 2009, electricity generated from water, wind, sun, biomass and geothermal technologies increased by approx. 7%, equaling almost 102 billion kWh, despite the fact that the wind energy sector fell behind its generating potentials even more strongly than in the previous year for weather-related reasons. While the total electricity consumption increased by 4.3% compared with 2009 as a result of the economic upturn, the share of renewable energies in total electricity consumption increased to 16.8% (2009: 16.3%). In 2010, approximately 80 billion kWh or about 80% of renewable electricity were fed into the public grid and were compensated under the Renewable Energy Sources Act (EEG – Erneuerbare-Energien-Gesetz). Thanks to the regulations in the EEG 2009, it was possible to continuously extend the share of renewable energies in the electricity sector (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2011, p. 4). The trend of setting-up new power generation capacities in 2009 and 2010 shows that despite a period of economic difficulty this was possible in most cases.

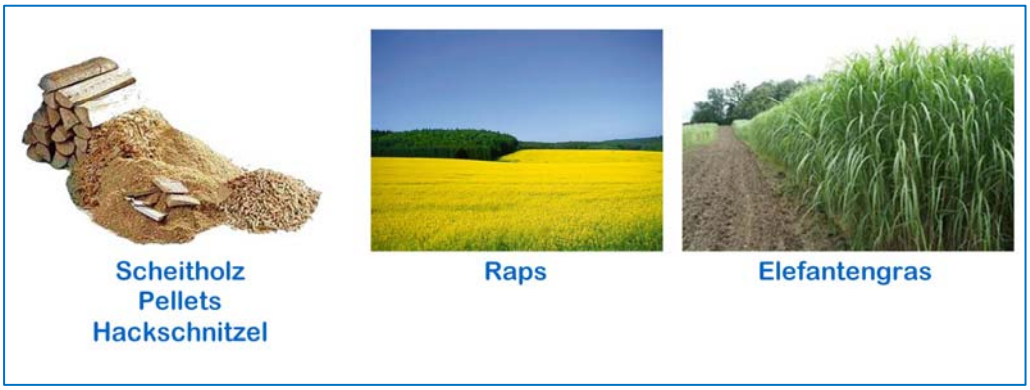
5.3. What are renewable energies?

Renewable energies, also regenerative energies, are referred to as either types of energy generated from sources that renew themselves within a short period of time, or as types of energy whose usages do not exhaust the source. The sources are sustainably available energy resources, of which particularly hydropower, wind energy, sunlight (solar power), geothermal and tidal power (energy generated through tides) are regarded as examples. The types of energies (electricity, heat, fuel) that can be generated from renewable energy sources are frequently as well referred to as renewable energies.

Source: Heinz Hasenkamp, 2001, p. 19.

Figure 5. **Energy sources – hydropower, wind energy, solar power, geothermal power**

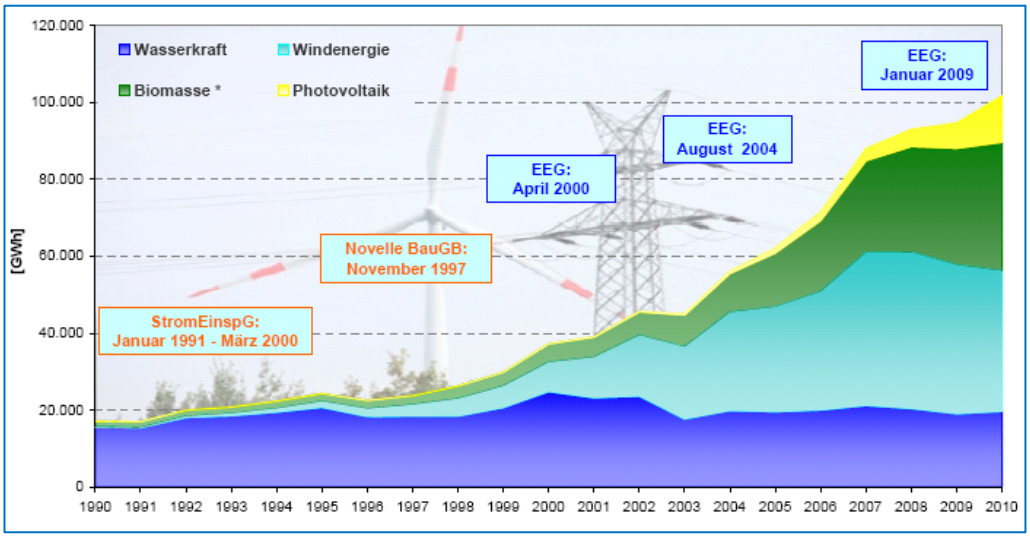
Biomass, which is generated from renewable raw materials, is also a type of renewable energy. This process involves that plants first absorb CO^2 which is later released in the combustion process. Biomass raw materials include rape, wood logs, pellets, elephant grass and wood chips. Elephant grass only requires little amounts of fertilizer, thereby generating high yields. Per hectare, it is therefore possible to achieve up to 60 hectare of dried plants.



Source: Heinz Hasenkamp, 2011: 20.

Figure 6. **Energy sources: wood logs, rape, elephant grass**

Together with crafts enterprises, universities must be encouraged to find out how to best use this potential and to develop and refine new technologies, to bring them to market-maturity and to sell them on the market.



Source: Edelhoff, 2011, p. 8.

Figure 7. **Contribution of renewable energies to Germany's electricity generation (Solid and liquid biomass, bio gas, landfill and sewage gas, biogenetic proportion of waste: 1 GWh = 1 million kWh; geothermal energy not shown due to little contribution to electricity generation)**

As regards different energy sources for electricity generation in Germany, wind power is the source most frequently used (35.9%). Hydropower makes up 19.4%, biomass 12% and photovoltaic systems 11.8% (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2011, pp. 6-8.).

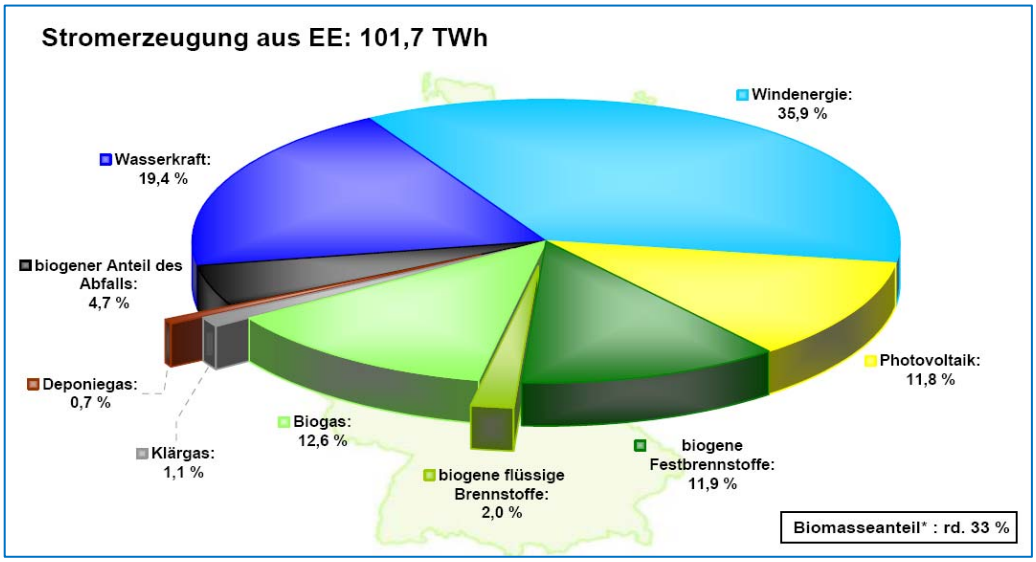
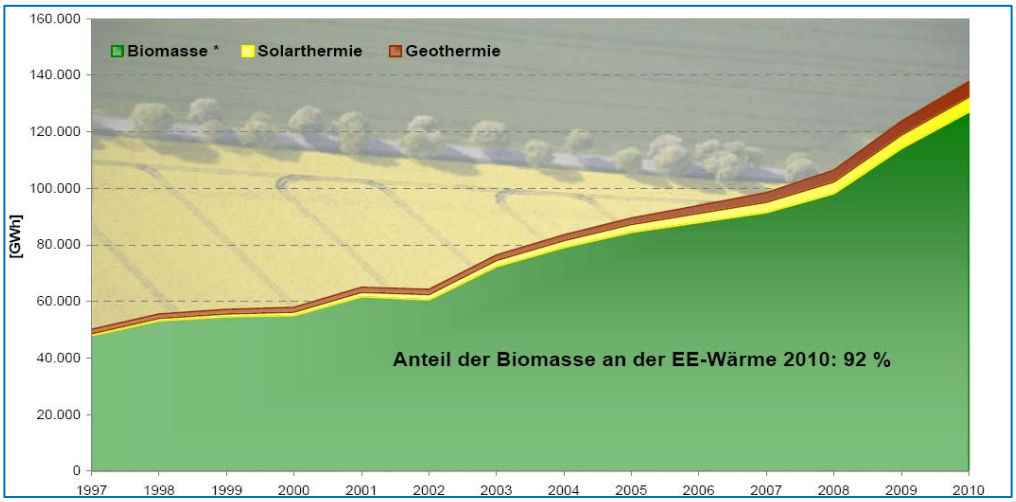


Figure 8. **Structure of electricity generation from renewable energies in Germany – 2010 (Solid and liquid biomass, bio gas, landfill and waste gas, biogenetic proportion of waste; geothermal energy not shown due to little contribution to electricity generation; 1 TWh = 1 billion kWh; discrepancies in the totals through BMU-KI III 1 by working group Erneuerbare Energien-Statistik/AGEE-Stat. – renewable energies statistics, 2011, p. 8)**

As regards the different energy sources for heat generation, biomass has the biggest share with 92%. The trend for wood pellets is decreasing, while solar energy has become more important in 2010. With a stable 92% contribution to total heat supply from renewable energies, also in 2010 biomass played the dominant role. In total, biomass provided approx. 127 billion kWh which is about 11% more heat than in the previous year (114 billion kWh). Heat generation from biogas (about 17%) as well as heat pumps and the use of wood in private households (about 14% each) have experienced the highest growth rates.

Classical wood logs still have a major share when it comes to the generation of heat from biomass. Within the last years, however, the use of wood pellets in modern heating systems has increased steadily. In 2010, it reached an amount of approximately 1.2 million t (2009: 1.1 million t). Nevertheless, the set-up of pellet heating systems amounted to 15,000 in 2010, thereby being a quarter lower than in the previous year. The current number of pellet heating systems in Germany should be

about 140,000. The expansion of the use of solar thermal power slowed down in 2010. With about 1.15 million m², this meant approx. 27% less collector surface than in 2009. This adds up to a total installed collector surface of ~14 million m² by the end of 2010. With 5.2 billion kWh (2009: 4.7 billion kWh), equaling a share of 0.4% of Germany's total heat consumption, the heat generated from solar thermal power increased by 10 % compared to 2009. This amounts to a total number of approx. 1.5 million solar power installations currently being operated in Germany. Also, the expansion of new heat pump systems slightly slowed down in 2010. 47,700 newly installed heat pumps reflect a decrease of approx. 13% compared with the previous year. The total number amounted to 360,000 heat pump systems by the end of 2010, generating about 5.3 billion kWh (2009: 4.6 billion kWh) (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, 2011, pp. 9-10).



Source: *BMU/Brigitte Hiss, 2011, p. 9*

Figure 9. **Energy supply from renewable energies in Germany 1997 to 2010 (Solid and liquid biomass, bio gas, landfill and waste gas, biogenetic proportion of waste; 1 GWh = 1 million kWh; BMU-KI III 1 by working group Erneuerbare Energien-Statistik/ AGEE-Stat. – renewable energies statistics**)

In the field of environmentally-friendly heating and energy technologies, energy is frequently generated through water and wind power systems. Criticisms often include their distance to residential areas, alterations of the countryside as well as their impact on local ecology. This is why so-called offshore installations are built to use the wind force of the open sea.

Solar thermal systems generate heat energy, while photovoltaic systems are used to generate electricity. Heat pumps take heat from the earth, water or air and supply it to the room. During the last years heat pumps were technically improved

and, thus, ensure a smooth and save usage. During the summer, they can as well be used for air-conditioning. In geothermal energy systems, heat is withdrawn from the earth. Particularly in the Ruhr area the experience from mining can be used. District heating power plants supply entire apartment complexes with electricity. Block-type thermal power stations can be switched to a decentralized power supply. In this way, a supply by large-scale power stations such as nuclear or coal-fired power plants can be avoided. By means of so-called "family power plants", people can generate their own electricity, thereby being able to supply a traditional single-family house with 80% of the required energy. However, the offer of such installations is still strongly limited due to their complexity.

5.4 Environmentally-friendly heating and energy technologies


Hydropower plant


Wind power system


Solar power plant


Air/water heat pump


Geothermal heat pump


Wood-chip plant


Combined heat and power plant


Decentralized systems


Wood-chip plant

Source: Heinz Hasenkamp, 2011, pp. 28-32.

Figure 10. **Environmentally-friendly heating and energy technologies**

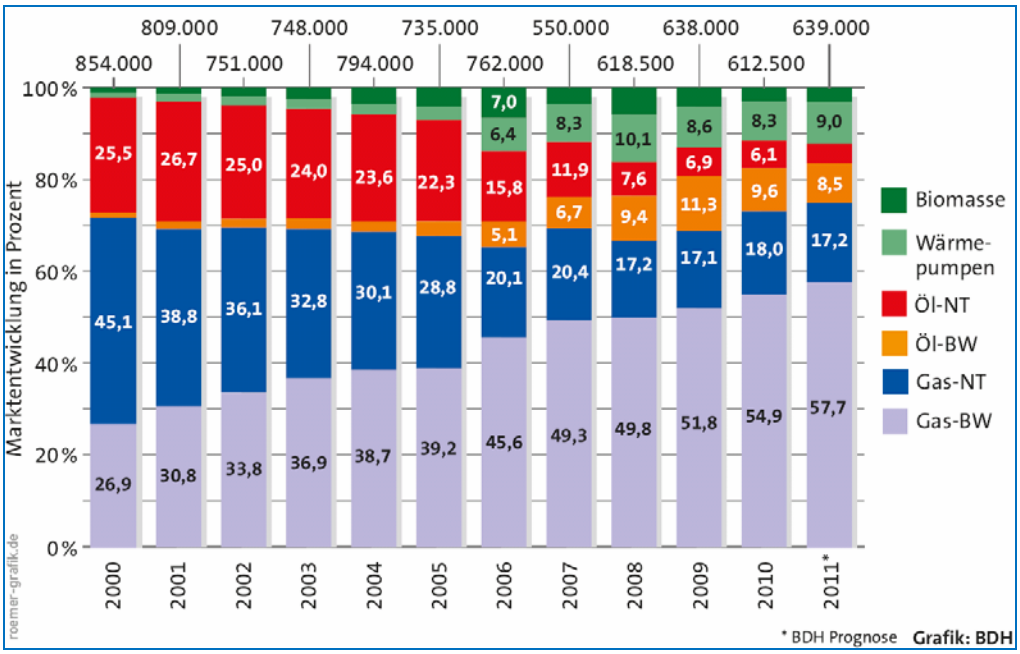


Figure 11. **Market development heat generation 2000-2011 (Bundesindustrieverband Deutschland Haus-, Energie- und Umwelttechnik e.V., 2011)**

The market for heat generation has developed as follows: the importance of gas-fired combustion systems has increased since 2000; the amount of gas low-temperature boilers has decreased and oil installations have nearly disappeared. However, also heat pumps have not quite established themselves. Investments for renewable systems amounted to 19,500 million Euro in 2010.

6. Consequences for a crafts enterprise in the field of sanitary, heating, climate

6.1. Responsibility

Together with the Craftsman Association and other associations, increasingly more crafts enterprises work on a mission statement. It has to be noted that relationships among employees are very personal in crafts enterprises. Every employee has to deal with the purpose of such a new direction in good time and changes are frequently made with heart and mind. Economic activity therefore is firmly integrated into the mission statement. Not only the enterprise as such but also employees and customers profit from an “honest” sale of “green” energy and a professional handling of new technologies. A sustainable business strategy also has an impact on procurement: The use of ecological and recyclable raw materials is of major

importance for the selection process. Also, the outer appearance has to be adapted to the concept of sustainability, i.e. with respect to the design of company cars. The overall picture has to match the enterprise's values. Moral and business ethics become increasingly important and must be put into practice by the enterprise.

Among their self-imposed, sustainable standards, crafts enterprises also exchange views with other regional enterprises in a spirit of partnership. The consultancy company "Trifolium" developed the "Bochumer Nachhaltigkeitscheck" (BNC, Bochum's sustainability check). It is a self-assessment instrument for sustainable management. Within the scope of this project, enterprises in Bochum analyzed their business based on economic, ecological and social aspects. The measures derived led to progress in the sustainable and balanced business development and served as a further guideline for the future of the crafts sector.

Source: Hasenkamp 2011, p. 32.

Figure 12. **Company car of Hasenkamp GmbH**

Taking over responsibility particularly means to comprehensively face economic, ecological and social needs and to respond to them in a sustainable way (Trifolium – Beratungsgesellschaft mbH, 2004, p. 2). The crafts sector communicates this self-consciousness to the general public. Quality seals, certifications and awards such as innovation awards, specialist partnership logos or awards for special customer service enable craftsmen to differentiate themselves from the broader mass. Thus, craftsmen can signal trust and expertise in service to their customers. The customer then feels more secure and trusts to be in good hands.

6.2. Training and further education

Source: Heinz Hasenkamp, 2011, p. 40

Figure 13. **Awards, partnership logos in the crafts sector**

Master craftsmen continually provide training to their employees. In this respect, education and further training represent an essential component to make complex connections between ecological thinking and innovative technology more tangible. Also, it is inevitable that those concerned are willing to learn. The range of training service also includes strategic curricula which are developed and implemented by associations. The acquisition and poaching of apprentices is an essential element to counter the lack of apprentices. By implementing such measures, the enterprise becomes more self-confident and opens its view for an entirely new horizon. Those who invest in education now will be best prepared for the future.

6.3. New job profiles

Moreover, industrial partners and associations offer continuous training opportunities. This leads to the development of new job profiles such as plant mechanic, installer, electrical engineer for energy and building technology, roofer with a focus on solar thermal power, engineer for control electronics and additional qualifications for becoming “assistant for efficient energy – and resource-related business practices in the crafts sector”. In addition, there are also new study courses focusing on renewable energies. This development creates a know-how transfer between crafts enterprises and universities, which act as innovation pioneers in the field of ecological thinking and action, without neglecting economic interests.

6.4. Target groups

Ecological rethinking leads to new strategies and, thus, to new target group markets. One of the private sector's main target groups are private home owners with an average living area of 111m². 66% of these have a monthly income situated above 2,250 Euro. The group is dominated by 40-49 year-old people having a good level of education achieved through an intermediate school-leaving certificate (Realschulabschluss) or a higher school-leaving certificate (Abitur). Of the 3.1 million Germans who use renewable energies, a share of 64% owns a private single-family house (Roland Berger Consultants, 2009, p. 35). The internet allows house owners to inform themselves more easily about complex heating technologies. This opportunity asks that the craftsman be highly educated and informed about the latest technologies in order to be able to advise the customer in a self-confident and competent manner.

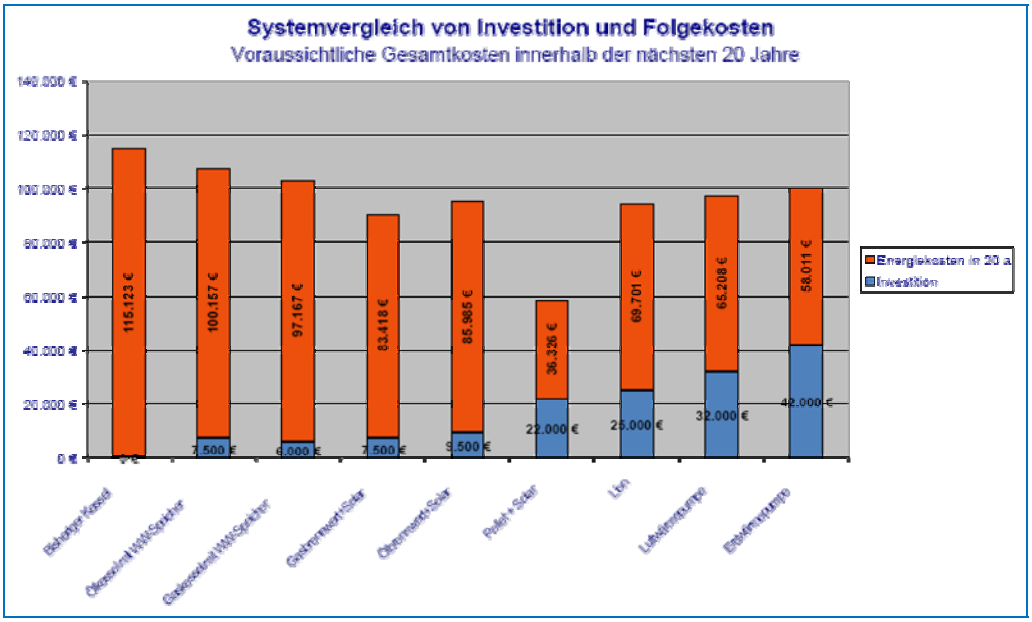
Municipal companies are also part of the new target group. However, they have another profile than the retail client. They are more hesitant and can realize projects only under clear guidelines. This circumstance is accompanied by a way of acting which impedes innovations. Financing problems and bureaucratic regulations often represent problems this target group is faced with. Decision-makers are frequently poorly informed. Effective public activities such as school programs and other measures help to create confidence among the public. In this respect, the crafts sector is in charge of providing an accompanying and enlightening dialogue.

Another target group is the industrial sector. It is characterized by quick action whenever profitability analyses lead to a commercially positive result. Normally, medium and high-duty plants are used. Comprehensive considerations and energy analyses as well as a high requirement profile as regards technical specifications are essential. In this respect, the focus clearly lies on the price-performance ratio. Also foreign products are accepted.

6.5. Marketing and sales

It is necessary to establish new, innovative marketing strategies and to develop a broader marketing portfolio. The integration of a sales department within the crafts enterprise is an important element to market and promote products for renewable energies. An energy-saving center, exhibitions for environmentally-friendly heating technologies or supraregional training centers offer craftsmen the opportunity to provide customers with a hands-on demonstration of innovative energy-saving solutions such as heat pumps or solar technology. Moreover, the customer must understand that nothing is "free".

The value achieved through a rethinking in the energy sector has its price. Appropriately, the crafts sector makes use of energy system comparisons to provide each customer with the best possible individual energy-saving solution. Chambers of commerce and universities support the development of such programs that allow a comparison of systems.



Source: shk-aktiv² Unternehmensberatung GbR, 2009, p. 39.

Figure 14. **System comparison based on investments and follow-up costs – expected total costs within the next 20 years**

With the help of intelligent system comparisons, customers realize that higher investments and purchase costs almost always imply considerable and more sustainable energy savings. The implementation of marketing and sales initially requires five steps. First, an equipment inventory at the client's premises as well as an analysis of different heating concepts is necessary. Based on this, the best suited concept is chosen which is then visually presented to the customer before it is implemented. After the installation and commissioning the craftsman provides further service to the customer by offering maintenance services. Also, the marketing mix has to be rethought. While print advertising markets the topic of renewable energies in a more classical way, online marketing becomes increasingly important. Apart from a comprehensive and informative homepage on the topic of renewable energies, it is further required to prepare the corresponding, so-called, "key words" for *Google*. Thus, a sustainable search engine optimization is inevitable.

6.6. Publicity measures

Furthermore, publicity measures such as sponsoring, innovative vehicle advertisements, information events or discussion forums constitute effective marketing strategies. High-quality and informative customer magazines on the latest

energy-saving solutions arouse the customers' interest and, thus, shall generate a need for action and consulting. Strategic partnerships with institutions (e.g. Geothermiezentrum Bochum, Bochum University of Applied Sciences/Solarcar) lead to an authentic external presentation of recognized crafts enterprises.

6.7. Financing

Also, the important field of financing and funding as well as the explanation through competent employees is relevant and important, as the crafts sector will have to draw on university graduates with respect to the handling of these complex themes in the future. In addition, money will be needed for new education and marketing concepts as well as for working capital requirements, entailing that, apart from long established banks and saving banks, new financing partners emerge (GLS-Bank, KD-Bankengruppe). Accompanying tax advisory activities are crucial and amortization programs have to be set up and explained. This deserves a high level of attention and the performance of networking specialists with a high degree of competence.

6.8. Planning and installation from a single source

As regards the planning and installation of environmentally-friendly heating technologies to use renewable energies, the craftsman has to draw on his comprehensive abilities of being an "all-rounder". As an example, the construction of a combined heat and power generation plant demonstrates the different areas of responsibility.

Figure 15. **Planning and installation of a combined heat and power generation plant (The planning and installation of a combined heat and power generation plant has many components: financing, application, specialist planning, dimensioning, logistics, strategy, statics, technology, installation and implementation, commissioning and training, maintenance and inspection, remote monitoring and control, profitability analysis, network integration)**

6.9. Creating added value

Thanks to education and further training, crafts enterprises can achieve higher profit margins and unique selling propositions by adding more environmentally-friendly heating techniques to their portfolio, thereby being able to avoid price dumping. Competent specialist partnerships between manufacturers and craftsmen ensure a marginal return security. The focus lies on image improvements that are communicated to the public, a high acceptance through professionalism as well as high company individualization. Thus, the enterprise becomes a full service provider in the fields of planning, implementation and maintenance. This ensures future and site security and also facilitates a later business hand-over thanks to sustainable projects.

6.10. Cooperation and synergies between institutions and recognized crafts enterprises

By cooperating with renowned institutions, the crafts sector emanates professional competence and can benefit from the latest research results. In return, institutions benefit from financial support for scientific research projects. Examples for effective partnerships are the cooperation with the geothermal center in Bochum or the support of the solar car team of Bochum University of Applied Sciences (see also paragraph 6.6).

Source: GeothermieZentrumBochum e.V., 2012.

Figure 16. **Logo "Geothermiezentrum Bochum"**

6.11. Partnership-based networks

The "InnovationsAllianz" (InnovationsAlliance) considers itself a partnership-based network. It is made up of universities, universities of applied sciences and university-transfer institutions in North-Rhine-Westphalia, in order to promote their

scientific and research expertise, to integrate it more strongly in practice and to create a common platform for cooperation with partners from the business world. The partnership with the crafts sector offers synergies for all those involved. For instance, the crafts sector benefits by gaining competent young professionals (e.g. industrial engineers) for sales and marketing of environmentally-friendly heating technologies.

Moreover, this alliance gives the crafts sector a better understanding of important scientific research results. In return, sciences benefit because scientific findings and innovative products are tested in the business world through crafts enterprises and are checked for market-maturity.

Source: Heinz Hasenkamp, 2011, p. 67.

Figure 17. **Heinz Hasenkamp participating in the discussion of "InnovationsAllianz" in 2009**

6.12. Guaranteeing the future

In the future, marketing innovative heating technologies will become another important pillar (besides the traditional crafts services) in crafts enterprises.

The field of renewable energies therefore offers craftsmen a good chance to both secure future jobs as well as their respective enterprise's location. The future succession gains a strong foundation through a future-oriented direction of the enterprise. At the same time, new business structures emerge through an expansion of the scope of activities.

Through attractive new job profiles and a high demand for qualified young professionals, the crafts sector offers interesting jobs, also in the future. This is where cooperations with universities, universities of applied sciences and the Innovations Alliance come full circle.

6.13. Sustainability

The crafts sector plays an important role as a "harvester" for the acceptance and integration of environmentally-friendly heating technologies and promotes the use of ecologically renewable energy-resources in society.

The increasing importance of renewable energies boosts innovations through a new kind of creativity in the crafts sector. Binding guidelines for a careful handling of entrusted goods and a sound energy policy will safeguard and generate jobs for decades.

Of course, craftsmen have to show commitment to ensure the future of securing resource-saving energies. Also, they have to train themselves further and must pass on their knowledge to all employees. Only in this way it is possible to mark the beginning of the required process and to apply sustainable operations to ensure an environment worth living in. In this way, crafts enterprises do not merely have a golden but finally also a green foundation, given that they are managed with human hand and mind, perhaps even with lots of heart. This is why the proven wisdom of craftsmanship holds good: "Roll up your sleeves and sort things out with a professional mind!"

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