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An application on the impacts of human resource management in technology management of the companies

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Abstract

We study the impact of human resource management (HRM) in terms of technology management in the companies. Our sample, 17 of which are partially or totally foreign owned consists of 37 companies operating in Turkey. HRM applications in R&D management of the firms imply that in our sample; empowerment, career satisfaction of the R&D personnel, compensation and comfortable working environment for R&D personnel are supported. Therefore, in our sample career mobility in R&D personnel is not generally met. Their business environment satisfy them and they work efficiently, they don' t move much. 9 respondents imply that R&D personnel is included in job rotation with different goals. Another result of our survey shows that for total sales and exports, R&D activities are considered to be highly effective. In conclusion R&D budget is evaluated as sufficient by 29 respondents in our survey. Further study will be made focusing on the sectoral differences about HRM effectiveness in technology management of the companies operating in Turkey.

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Keywords:Innovation; Human Resource Management; Research and Development.

1.Introduction

Human resource management (HRM) is undoubtedly emphasized in all the world literature. Motivating, empowering, satisfying, training and developing the personnel, providing their behaviours to fit the strategy and adapting them to the competitive environment are the main tasks of the HRM in the companies. On the other hand, nowadays concepts like the global village and the competitive environment forces the companies to be innovative. Innovation is a wide concept including a lot of aspects. HRM is related with all of the innovative processes in the companies. Strategic HRM is considered to be the partner of the top management in the companies.

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HRM should cascade the strategy of the organization to the whole company. On the other hand organizational climate and culture is highly related with the innovation performance of the companies. HRM directly or indirectly affects organizational climate and culture. Briefly, HRM expresses the brain power of the companies.

2.Innovation

Innovation concept is firstly used by economist and political scientist Joseph Schumpeter as the forcing power of development. He defined innovation as a product or a new characteristic of a product which is new for the customers in the market, using a new production system, a new market, finding a new source to supply the raw materials or semi-manufactured products or the reorganization of a company in his book that is written in 1911 and translated to English in 1934. According to his view the entrepreneurs create dynamism in the economy by breaking the equilibrium in the market with their innovative roles. In Latin language "innovatus" concept has a meaning of using new methods in social, cultural and administrative environments. Encyclopaedia of Webster defines innovation as a new and different result. Innovation is mostly related with the results more than itself as an economic and social process which is changing and differentiating [5]. Innovation is a link in between creating new ideas and the market [9].

Table 1. Innovation Types

ACCORDING TO THE CONTENT		**ACCORDING TO THE DEGREE**	
PRODUCT INNOVATION	**PROCESS INNOVATION**	**RADICAL INNOVATION**	**INCREMENTAL INNOVATION**
-A new product or service in the market -Increasing the competitive value of a product or service in the market	-A change in the way of creating a product or supplying a service	-Innovations that create a new market - Innovations that make big changes in the market -A new technology	-Performance, security, quality or cost type of a innovation -Usual changes

Source**:** Kiliç ve Bilginoglu, 2010: 219

2.1. Innovation As A Competitive Advantage For The Companies

Today's business world depends highly on the innovations created by the companies and preferred by the customers. Beforehand, quality, reliability or low prices had used to distinguish the companies in the market. But today every company can reach these goals easily. Competitive advantage with low price, quality or reliability is achieved by the companies. What makes the companies differentiate in the market is through innovations nowadays. According to Schumpeter innovations create great profits for the companies; but afterwards other companies imitate these innovations. So new innovations are generated and this innovation process goes on saving the importance of the innovations. Innovations increase the efficiency in the companies, develop the communication and service sectors, increase the social and human development and resource usage effectiveness. In parallel to the increasing importance of innovation, there had been a need to improve systematic models of the innovation process. Meanwhile,

the lineer models that are created at the beginning became more complex and included a lot of activities. In between 1950 and 2000 the models that are created had been 90 and included 54 activities [5].

Lineer models of innovation included steps as need pull or technology push. Afterwards more complex models developed steps like feedback loops, parallel developments, upstream and downstream linkages and extensive networking. Schumpeter suggested a model with 3 steps: invention, innovation and diffusion. A model developed by Tidd, Bessant and Pavitt is presented in Table 2 [9].

As a dynamic capability of the firms, innovativeness requires lots of company characteristics. Innovation literature develops from the lineer model of creating a new idea or product to systematic models of different sides of the companies. The common side of all the suggested models is the people' s behaviours during the changes and uncertainities [11].

In strategic management literature a great emphasis is on the concept of innovation, as the term expresses creating value and sustainable competitive advantage for the firms in the increasingly complex and fastly changing business environment. The firms that are ahead in innovation can enhance their responsiveness to the environmental changes and improve their skills to perform better in their business lives (Chen and Huang, 2009: 104). Innovativeness helps the firms to decrease their costs, to perform better and create new products and services [1].

Cascading the company strategy to R&D departments is the way to widen the strategy of the company to all of the organization and support the R&D personnel working for the strategy of the firms. But this cascading should not be a top down control; contrarily should create a dialogue in between the top management and R&D personnel, motivate them and help them to discover what they can produce for the company and easily define their views and anxieties [10].

Table 2. Innovation Process Model

<table>
<tr><th>SIGNAL</th><th>STRATEGY</th><th>RESOURCE</th><th>IMPLEMENTATION</th></tr>
<tr><td rowspan="2">Environmental scanning: technological, regulatory and other signals.</td><td>Analysis, choice and planning.</td><td>Realizing the steps for the strategic decisions.</td><td rowspan="2">Maturity</td></tr>
<tr><td>Interpreting the signals for the possible actions to be taken.</td><td>R&D</td></tr>
<tr><td rowspan="2">Seperating the signals from the background noise.</td><td>Linking with the corporate strategy.</td><td>Using existing R&D</td><td rowspan="2">Technical and market development in parallel. For product development this is external customer market. For process development this is internal user market. “Change management”</td></tr>
<tr><td>Linking with the core knowledge.</td><td>External R&D contracts</td></tr>
<tr><td>Scanning the future time.</td><td>Assessing the costs and benefits.</td><td>License or buy-in</td><td>Launch and commission.</td></tr>
<tr><td>Signal interpretation and decision making.</td><td>Decision making and supplying the resources.</td><td>Technology transfer</td><td>Sales support</td></tr>
</table>

Source: Leede and Looise, 2005: 110.

2.2. The Sources Of Innovation

Innovation depends highly on the knowledge, expertise and loyalty of the employees as the key inputs in the value creation processes of the companies. According to the knowledge based view, the companies gather the knowledge and qualifications of the employees. As the knowledge and qualifications of the human resources are special, socially complex and develop depending on the way that the companies follow, they are extremely important for the firms [4].

The success of the personnel in a given task is not just related with the abilities of the personnel; but also highly related with the motivation of them. Scientists and engineers, like the other people are directing their personal motivations according to their perceptions of the relationship between the effort, performance and award. These perceptions are reflecting their expectations according to their needs. In HRM and organizational behaviour personal needs are defined to be internal or external according to their nature [1].

External motivation is obtained by satisfying the needs of the personnel indirectly, most importantly through the monetary remuneration. Especially for the research and development (R&D) personnel, the positive relationship between the payments and the work effort is stressed in the literature. In some studies it is argued that the R&D personnel (like the personnel who invents) is different from the other personnel in terms of their preferences about their career, values and remuneration with their technical skills and in managerial strategies, this has to be taken into account [1].

Other than payment, there is also a positive relationship between the external encouragements like satisfaction and professional development in the organization. As the R&D personnel is highly educated and their human capital investment is more risky, the traditional working descriptions are not the best remuneration mechanisms for them. Payment according to the skills and abilities is a better and more effective mechanism for training and career development of them both in the organization and outside. Technical personnel with high performance should have high technical positions in the organizations in order to provide their sustainable motivation in the companies. In another study, it is argued that the scientists and engineers are motivated by improving new skills and creating innovations [1].

2.3.Human Resource Management and Innovation

With the increasing importance of the innovation, the managerial practices that support the innovation process had been improved. As the source of innovation is creating a new idea, the human capital had become more important and HRM practices had been a first step ahead of the other techniques. Innovation performance of different people are also different; so HRM practices should emphasize the recruitment and selection of the personnel. So the recruitment and selection activities are so important for today' s business world [7].

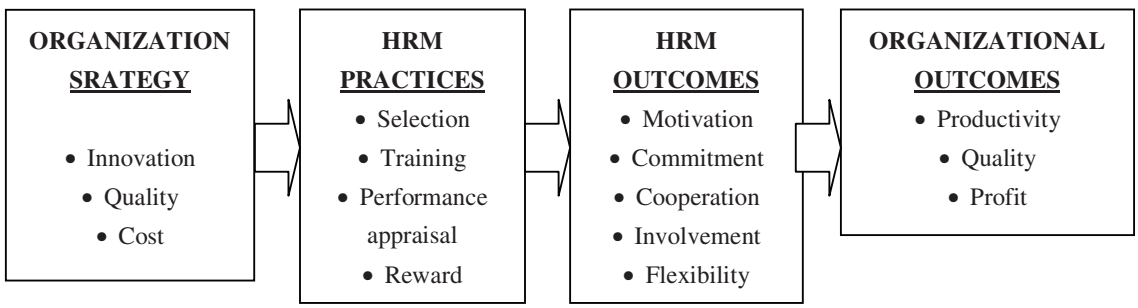
Although HRM, which is defined as all the managerial decisions and activities that affect the nature of the relationship between the companies and their personnel, and innovation seem to be much related with each other; when we observe the HRM literature we meet with very few studies that searched for this relationship. On the other hand, when we observe the innovation literature, HRM is emphasized more but; it is considered as o tool that is used in the innovation process and composed of some defined specific activities [7].

HRM studies had generally stressed the relationship between the organizational results like the firm productivity, flexibility, financial performance and HRM practices. These studies have to be improved

including the innovation performance of the firms [4]. HRM practices in R&D departments of the companies has become to be a new topic in HRM studies. Because there isn' t enough study about this topic that includes more than one company in the research field. Or the studies had been applied in a sample which includes companies that are low or high in technologic innovativeness [1].

In HRM literature most studies had been about the corporate strategy, strategic HRM and organizational performance. In the boxes model of Guest which is presented in Exhibit 3 the steps of these models are summarized. Huge interest in HRM practices comes from the innovation researchers, but the opposite is seen less. In HRM literature innovation is considered as a corporate strategy. On the other hand, in innovation literature HRM is an instrument. So an integrative approach should be developed to analyse the relationship between HRM and innovation [9].

Figure 1. HRM and organizational outcomes



Source: Leede and Looise, 2005: 111

Basicly, HRM is related with innovation by the aspects listed below:

- Organizational structure,
- Staffing,
- Roles of the individuals,
- Individual development and careers,
- Teamwork and leadership,
- Communication and participation,
- Performance appraisal and reward,
- Creating a creative organizational culture[9].

Innovativeness is achieved through encouraging the human capital to develop organizational expertise for creating new products and processes. On the other hand organizational expertise is so complex and can be structured by planned practices for the required tasks. These planned practices aim the individuals to perform best and improve their skills. So the firms develop a group of strategic HRM practices to motivate their employees for creating organizational expertise. Strategic HRM practices help the companies to discover their knowledge and expertise and use them in their business activities [4].

To improve the innovations and commercialize; the sources of the companies in R&D departments are managed by high skilled employees. HRM managers claim that the innovativeness of the firms depend highly on the adaptation of those R&D employees to the innovative HRM practices of the firms. This process requires empowerment and managerial support [1].

3. HRM and Innovation Studies

Ángel and Sánchez had used the case study approach in their analysis. They had face to face interviewed with the R&D managers of the chosen firms about their HRM practices and looked for the relationship between R&D management and the firms' HRM policies. Open ended questions about the HRM practices had been about empowerment and managerial support, networks and interdisciplinary teams, recruitment and selection, job rotation, remuneration and career development. Also a list of questions had been about the innovation results, like R&D investments and the performance appraisal about the R&D achievements. At the end of this study recruitment and selection and networks and interdisciplinary teams had been the HRM practices that are adapted to the R&D department. Empowerment and managerial support had less been adapted to the R&D departments. Same results for the remuneration and career development as less been adapted; but job rotation had been adapted to R&D department at medium level [1].

In another study Beugelsdijk looked for the relationship between 6 HRM practices and the new products' sales rates in total sales of the companies. Research method had been survey questionnaire with the managers or HRM managers. HRM practices used in this study had been training, job rotation, job autonomy, flexible working hours, standby contracts and performance based payment. For innovation results there had been a differentiation between radical and incremental product innovations. Also the study includes a list of control variables like R&D intensity in the sector, firm size, firm structure, export intensity, the age of the firm, ownership structure of the firm, competitive environment, product diversity, product type, customer type, technologic structure in the sector and the location of the company. The results of this study shows that the task autonomy and remuneration based on education and performance have positive correlation with innovation process. Especially in radical innovations task autonomy and flexible working hours are mostly effective. Also there are relationships in between the HRM practices, HRM practices and the firm sizes with the R&D intensity [2].

Chen and Huang studied top 5000 Taiwanese firms as the population and used a stratified random sampling method for each 1000 levels and selected 150 firms for each level. Questionnaires, which include background information, strategic HRM practices, knowledge management capacity and innovation performance with 7 point Likert scale responses are sent to the top executives who are familiar with the topic and 146 valid questionnaires are used for this study. Dependent variables are administrative innovation and technical innovation; independent variables are staffing, training, participation, performance appraisal, compensation, knowledge acquisition, knowledge sharing and knowledge application; control variables are firm age, size and sector (manufacturing and high-tech industries). Results of the regression analysis show that strategic HRM practices positively affect innovation performance with the mediating role of knowledge management in the companies [4].

In international management literature there is a close relationship between organizational internalization and innovation. International companies have to form their HRM practices in order to improve the abilities of their employees, increase their autonomy and loyalty, remunerate based on merit and performance in order to have an innovative strategy. In this study there are two hypotheses. First one is that; internalization of a workplace is positively related with the high performance workplace practices (HPWP). Second is that: while workplace internalization is controlled HPWP is positively related with innovation. These two theoric relationships had been tested in a one data set at the workplace analysis level. The population of the study is all the private workplaces except the primary and agricultural sectors in 10 states of Canada. The workplaces have at least 10 employees. Sample of the study is composed of 2798 workplaces. Regression results show that for international workplaces; training is effective as a HRM practice for innovation; but different remuneration systems and employee participation is less

effective with respect to innovation [13]. In this study, innovation is measured by creating a new product or process.

Leede and Looise studied a case in Philips CMA (Ceramic Multilayer Actuator). They summarized the phases of the plant through HRM and innovation relationship in Table 3.

Table 3: Philips CMA

YEAR	PRODUCT INNOVATIONS	PROCESS INNOVATIONS	ORGANIZATIONAL INNOVATIONS	HR
Late 1980 s		**Ceramic material Multilayer technology**		Recruitment and selection for creativity
1991	Ceramic Multilayer Actuator	Taiwan		Recruitment and selection
1992	CMA for printers	**Netherlands-Philips CMA**	**Designing New Organization**	Recruitment and selection
1993	New Types Of CMA	- Perpendicularity of dicing cut - Statistical Process Control	- Kanban System - Process Action Teams - Job Consultation	**Employee Direct Participation**
1994	CMA Variants	Yield and efficiency	Mini-company concept	**Direct participation, coaching leadership**
1995	-	Yield and efficiency	-	**Training, direct participation and reward system for mini company**
1996	-	Yield and efficiency	-	**Direct participation**
1997	-	-	Closure of the plant	-

Source: Leede and Looise, 2005: 113.

The mini company concept presented in Exhibit 4 is firstly used by Suzaki (1993) referring to the work groups who are responsible for their own operations in the company. They are working on the principle of supplier-client relationship. Each process is evaluated as the customer of the previous process and supplier of the following process [8].

Corporate entrepreneurship (CE) has three components: innovation, venturing and strategic renewal activities. In Chinese pharmaceutical industry, small to medium sized biotechnology enterprises which have fewer than 500 more than 100 employees are chosen for this study. Company access is easily provided by personal contacts as traditional Chinese approach, guanxi. 3 separate questionnaires had been used for the CEO, HR managers and the employees. CEOs answered the questions about CE and HR managers high performance HR practices. Employees that answered the questionnaire were the frontline employees at the core departments of the enterprises. Of the 250 survey questionnaires 146 had turned. Of

the 146, 139 had been accepted as valid and analysed. Results show that high performance HR practices are positively related with organizational citizenship behaviour and CE [14].

Information technology innovation implementations in the companies require the support of HRM with a lot of aspects. Basic tasks that HRM should undertake meanwhile are; defining the tasks which should be automated, creating a reward system for the IT users in the company and providing the necessary training programs for the users [3]. In Table 4 HRM contributions to IT innovation implementations are summarized.

Table 4. HRM Contributions to IT Innovation Implementations

DIMENSION	HRM PRACTICE
New Organization & Job Design	- Definition of tasks - Responsibilities and boundaries of operations of the users - Restructuring the team work - New working time to learn and practise
New Forms Of Human Resource Flow	- Recruitment policy - Career development plans
New Forms Of Communication & Participation	- Participation in decision making in IT Project - Autonomy and freedom of the users in their Works with new IT - Autonomy of the users to communşcate with the IT supplier - Providing information for newcomers about new IT - Users' defining their training needs - Providing adequate training programs Available material resources to cover new IT
New Forms Of Performance & Reward	- Evaluation of the IT use - Observing the progress about the system use - Rewards and reorganization of the remuneration system for the users

Source: Bondarouk and Looise, 2005: 163.

Sunhow appliances in Taiwan decided to follow up an innovation strategy due to the lack of differentiation in the market. Market is intense about low price and high and tough competition even by big firms turning into this market. So an innovative policy has to be followed by Sunhow appliances. R&D in biotechnology and health care appliances had been a good choice to meet the demand of the market and potential customers. Sunhow appliances need to improve its employee professional skills to conduct job rotations. In each department of the company there is knowledge interchange and this makes the communication more effective. Training programs, in-service education and personnel related courses are required in the workplace. Remuneration, promotion, continuous development, establishment of an easy working environment, feeling welfare with the opportunities like accommodation, leisure time clubs or regular entertainment are the tasks of HRM to serve for the internal customers of the company [12].

Jiménez-Jiménez and Sanz-Valle studied innovation and HRM fit in region of Murcia (southern Spain) gathering data from a larger study made by the Economic and Social Council. Target population composed of 376 firms of which have at least 25 employees [6]. After defining the variables, logistic regressions and a two step hierarchical linear regression had been implemented for HRM practices as dependent variables, innovation as independent variable and the control variables. Results of the analyses

show that the firms that choose an innovation strategy use an incentive-based compensation and appraisal systems, create internal career opportunities and encourage employee participation. HRM paves the way for the firms to follow up an innovative strategy. Participation and promotion plans significantly affect the innovation performance [6].

4. An Application About HRM Effectiveness In Technology Management Of The Companies

4.1 Research Methodology

Our study is a qualitative research with a survey questionnaire composed mostly of open ended questions. Respondents are the HR managers of the companies which have a R&D department. Our criteria for the topic is that companies are big enough to have a HRM and R&D department. We have tested our basic hypothesis which is HRM practices and R&D management are positively correlated in Turkey. Our survey questionnaire is presented in the Appendix.

We prefer this technique as we believe that in Turkish business environment this is the best way to achieve the most reliable information about our focus related with the topic, R&D management in Turkish business environment with the evaluation of the HR managers.

4.2. Results

Totally HR managers answered 63 questionnaires. For 26 questionnaires the answer to question 10, which is about the existence of R&D department in the Appendix is “No” or there is no response. For 37 questionnaires there are R&D departments, one of which is newly established and one of which is established in the foreign country. Total 63 questionnaires will be analysed during the following part of our study.

For this part of our study, 17 of the 37 companies who have R&D departments have totally or partially foreign ownership. So operating companies in Turkey are foreign investments with a high rate close to half.

11 of the companies answered question #13 “Yes”, which means that HRM practices are different for R&D department. Some of them explained the open ended question as the R&D personnel have more salary and incentives, work in different conditions more comfortably than other personnel. That is appropriate for our study. We expect different approach for HRM applications in R&D departments.

7 of the companies replied question #15 “Yes”, which means that they are implementing flexible working hours for R&D personnel in their company. One of the companies explained the situation as “if the R&D personnel wants s/he can work in his or her extra time”. Flexible working hours mean efficiency depending on different working conditions. For Turkish business environment flexible working hours rate is low; but that can lead to better efficiency in this business environment.

6 of the companies replied question #21 “Yes”, which means that R&D personnel is included in job rotation process in the company. One of the companies answered the question “sometimes”, one of them answered “for a long time we hadn’ t practised job rotation for R&D personnel” and one of the companies answered “if there is a problem in another department they pass to this department to solve the problem”. Job rotation is suggested for R&D personnel in the companies with different goals. So this rate is low in the companies operating in Turkey. HR manager of a company states that R&D personel work with the

sales personnel. That is a good example. For effectiveness in terms of sales and exports job rotations enhance the capabilities and creativeness of R&D personnel within the companies.

For question #20, if the R&D personnel is empowered in the company or not; 16 company HR managers answered the question "Yes". Some of the respondents expressed this empowerment to be totally empowered, empowered with time or sometimes empowered. But most of them expressed this empowerment to be "certainly" and "exceedingly". Empowerment is an important criteria for R&D personnel. This rate is nevertheless good for Turkish business environment. For question #16, which is about career development programs implementation; 15 of the respondents express that they have these programs and they emphasize. Career development programs are emphasized in nearly half of our sample. Question about R&D personnel' s satisfaction with their careers is answered as "Yes" with 14 respondents. Related with this question career mobility is evaluated as to be rare with again 14 respondents. Career satisfaction decreases career mobility in the companies.

5. Discussion and Conclusion

We evaluate in Turkey career mobility in R&D personnel is less as the result of our survey. R&D personnel is empowered, sometimes they have managerial status in the companies. They have good remuneration. When we consider remuneration; 11 respondents say that they have team performance based remuneration. Their salaries and incentives are satisfactory for them. When they achieve managerial status they are satisfied more in the company. So the career mobility seems to be less in the sample of our study.

Question #12 is answered as "Yes" by 29 respondents in our survey. 8 of the respondents indicate that R&D budget of their company is not sufficient or they hadn' t implied anything for this question. One respondent implies that R&D activities bring more than it costs for the company. One company indicates that their budget is so huge. One indicates that R&D expenses are not sufficient; but ideal for their budget. Spending for R&D is crucial for the companies in our sample.

At the end of our questionnaire we have asked HR managers' opinion about the effects of their R&D activities on total sales and exports in question #24 and #25. 32 respondents answered this question "Yes". One respondent states that new products make the competition easier for them; one says R&D activities and total sales are positively correlated; one says R&D activities make the products&processes more qualified; most respondents use the term "absolutely supporting both sales and exports" and also one respondent points out that R&D personnel is working with the sales personnel. Working with sales personnel can be interpreted to be type of a job rotation and a successful practice for R&D personnel. HR managers believe that sales and exports are positively correlated with R&D activities in the companies operating in Turkey.

5.1. Future Research Implications

For the further part of our study we will make a sectoral differentiation based on the Turkish market. We will again use the methodology of this study, open ended questionnaire survey; because we believe that in Turkish business environment this is the best way to achieve the most reliable information about our focus related with the topic, R&D management in Turkish business environment with the evaluation of the HR managers.

This part of our study supports our basic hypothesis which is HRM practices and R&D management are positively correlated in Turkey. Because HR managers point out the differentiation in terms of technology

management of the companies. As discussed above, R&D departments in our sample are handled specially by HR managers. In the following part of our study, we believe that sectoral differentiation will point out this specialty of R&D personnel by HRM of the companies more definitely in Turkey. We will also point out the differentiation in terms of foreign ownership in the sectors as foreign ownership may change R&D spending and HRM practices in the companies operating in Turkey.

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Appendings A.

1. Job title ……..
2. Job experience ( ) 0-5 years ( ) 6-10 years ( ) 11-15 years ( ) 16-20 years ( ) 21 years and more
3. Name of the HRM function department in the management ……
4. Title of the HRM top manager ……
5. Title of the top manager for whom HRM is accounted for ……
6. In the last 3 years # of the new products and processes developed in the management ……
7. In the last 3 years # of the patents that the management achieved ……
8. Age of the management ……..
9. Foreign ownership in the management ……..
10. Existence of R&D department ……
11. # of the personnel in R&D department ……..
12. Do you believe that R&D budget of your company is enough? ……
13. Are there any differences for R&D personnel about HRM practices in your company?

……

……..

14. Is there team performance based remuneration for R&D personnel in your company?

..……

…….....

15. Is there flexible working hours application for R&D personnel in your company?

……

……..

16. Are career development programs important for R&D personnel in your company?

……

……..

17. Title of the person who directs the R&D activities …….
18. How often are training programs special for R&D personnel applied in your company?

……

……..

19. Title of the manager who evaluates the results of the R&D activities ……
20. Do you believe that R&D personnel is empowered in your company? …….
21. Are R&D personnel included in job rotation process? ……....
22. How often is career mobility in R&D personnel in your company?

……

……..

23. Do you believe that your R&D personnel is satisfied with their career?

……

……..

24. Do you believe that your R&D activities support your sales with new product and process development?

.....

.....

25. Do you believe that the results of your R&D activities increase your exports?

……

……..