

# *The Position and Success of Certified European Ergonomists*

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In collaboration with the

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## *Preface*

As part of a Master thesis project by Petra Breedveld from RSM Erasmus University, Rotterdam, The Netherlands (Breedveld 2005), a study was done amongst certified European ergonomists in co-operation with the Centre for Registration of European Ergonomists (CREE). This report summarizes this study. The full thesis can be requested by sending an e-mail to Jan Dul, supervisor of the project ([jdul@rsm.nl](mailto:jdul@rsm.nl)). Part of the data for this study has been published in other publications (Dul et al. 2005, Dul et al. 2005, Dul and Breedveld 2005).

We would like to thank the CREE, in particular Philippe Mairiaux and Maria Niessen, for the support we received during the preparation of this study. Also we would like to express our gratitude to the European ergonomists who participated in the study by providing valuable data.

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## ***Abstract***

This study focuses on European ergonomists, certified on the basis of criteria set by the Centre for Registration of European Ergonomists (CREE). Firstly, in a descriptive study, questions like: (1) Who are they? (2) Where they are employed? (3) How do they work? (4) What results are achieved? are answered. Secondly, in an explanatory study, factors that contribute to the acceptance and success of the ergonomists are explored.

The data for this research were collected using a web-based questionnaire survey. The questionnaire was sent to 255 European ergonomists. The results are based on data from 130 European ergonomists who responded (response rate 51%).

The results of the descriptive study suggest that the typical certified European ergonomist is a male, full time employed external consultant, around 45 years old, with Master degree and more than 10 years experience as ergonomist. The respondents had 15 nationalities; most of them were British, Dutch, French and German. The majority of the ergonomists is employed in a private organization in a service branch. They advise organizations mainly about health and safety, and engineering and technical topics.

Ergonomists cooperate most often with health and safety, and production departments in organizations for which they work, and with general management. They collaborate with different professionals, mostly with engineers, safety experts, and designers, and less with health professionals. Ergonomists work more on problem analysis and developing solutions, than on implementing and evaluating solutions. Ergonomists spent more time on physical ergonomics (44%), than on cognitive ergonomics (25%) or organizational ergonomics (27%). The most commonly used analysis methods are observation techniques and interviews. Partners who are involved in the ergonomics work of the ergonomist are workers, supervisors, specialists, and senior management.

More ergonomists consider their technical changes (e.g. workplace design), and their individual changes (e.g. training) more successful than their organizational changes. Social goals were more commonly reached than economic goals. More comfort was the most commonly reported social success of the ergonomics work; reduced human and system errors, and increased productivity were the most common economic successes.

Although ergonomists consider support from all stakeholders equally important, more support and less resistance is received from workers, rather than from managers. Ergonomists cope with resistance primarily by providing more information, and using a participative approach. Ergonomists encounter the problem that ergonomics is considered too late in the design process.

Direct contact with other ergonomists and books are the most common source of ergonomics information. The most frequently read international ergonomics journal is Applied Ergonomics; some journals are rarely read. Ergonomists frequently use standards and guidelines for their work.

The results of the explanatory study show that ergonomists who work in the manufacturing branch perceive relatively more acceptance and success than ergonomists who work in a service branch. The success of the ergonomist is related to cooperation with departments, cooperation with professionals, as well as to knowledge on ergonomics. Acceptance and success are not related to years of experience.

## ***Introduction***

The Centre for Registration of European Ergonomists (CREE) is an independent registration organisation for professional ergonomists that brings together and harmonises the views of some twelve national ergonomics societies within the European Union, to certify professional ergonomists working in Europe and award them the “European Ergonomist” (Eur.Erg) title. CREE was founded in 1992 and nowadays more than 300 ergonomists are Eur.Erg ergonomists.

Apart from some basic personal details, CREE does not have insight in the work of the certified ergonomists. For the 10th anniversary of the Eur.Erg Certification system, which was celebrated during the 1st European Forum for Professional Ergonomists in Paris, la Sorbonne - 4th and 5th June 2004, the CREE wished to have more information about certified ergonomists. As part of a master thesis project, a study was started RSM Erasmus University, Rotterdam, The Netherlands to collect such data.

The aims of this study were (1) to provide an overview of the position of certified European ergonomists within European organizations and their working methods, and (2) to explore factors that contribute to the ergonomist’s acceptance and success.

## ***Study Methods***

### **Questionnaire**

Data were collected through a web-survey using a questionnaire. The questionnaire contained questions in 6 domains:

- Demographics
- Employer and employment
- Ergonomics work
- Success of ergonomics work
- Acceptance of ergonomics work
- Sources of ergonomics information

Most questions were closed questions using a 5 point itemized Likert scale. The questionnaire was based on a conceptual model about factors that may be relevant for the acceptances success of ergonomists (Figure 1).

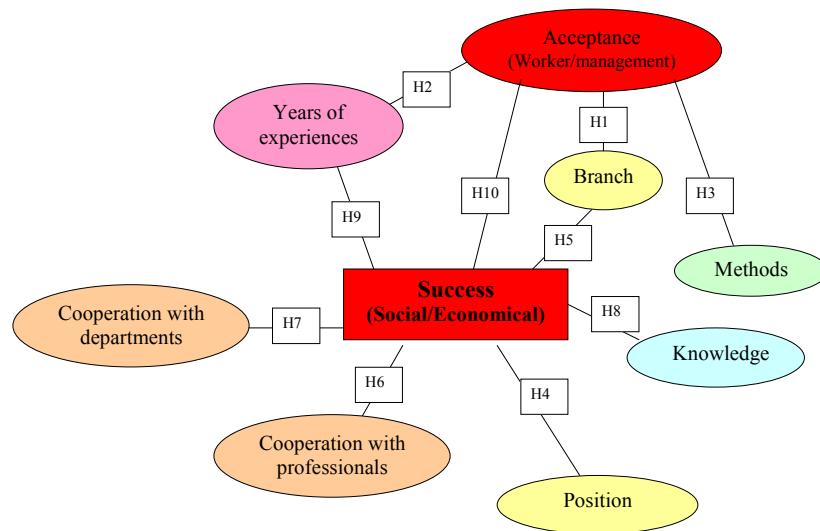


Figure 1. Conceptual model of possible factors contributing to acceptance and success of ergonomists

The factors (constructs) were measured by one or more questions in the questionnaire (Table 1).

Construct name	Questionnaire items included in the construct
Success	social success + economic success
Social success	improved worker' health + reduced physical work load + reduced mental work load + less pain and complaints + more comfort + less injuries + improved safety + improved motivation + better work satisfaction.
Economic success	cycle time reductions + increased productivity + reduced production costs + high return on investment + increased flexibility + increased product quality + increased innovativeness + reduced human and system errors + decrease in lost work time + reduced sick leave + reduced injury cost + drop in labour turnover
Acceptance	Worker acceptance + management acceptance.
Worker acceptance	Supporter workers/operators – opponent workers/operators.
Management acceptance	supporter: supervisors + supporter: middle management + supporter: senior management – opponent: supervisors – opponent: middle management – opponent: senior management.
Cooperation with professionals	occupational physician/doctor + occupational hygienist + occupational health nurse + occupational psychologist + occupational therapist + physiotherapist + engineer + designer + safety expert + quality expert + environmental specialist + organizational specialist + professors from universities + computer expert.
Cooperation with departments	general management + marketing + purchase + production + research & development + design + planning + quality control + finance + human resources + health & safety + facilities + computer services
Knowledge	methods + sources of information + standards + journals
Methods	computer models and simulation + real models, mock-ups and prototypes + use

	of expert opinion + cost-benefit analysis + observation techniques + checklists + interviews + questionnaires and surveys.
Sources of information	informal meetings + specially organized meetings + conferences + contact with other ergonomists + websites + books + journals and magazines + ergonomics reports
Standards	guidelines from books/journals + legal regulations + company standards + national standards + European standards + International standards
Journals	Applied Ergonomics + Ergonomics + Ergonomics International + Human Factors + Human Factors and Ergonomics in Manufacturing + International Journal of Cognitive Ergonomics + International Journal of Industrial + Ergonomics + International Journal of Occupational Safety and Ergonomics + Occupational Ergonomics + Theoretical Issues in Ergonomics Science

Table 1. Measurement of some constructs of the conceptual model

The census of this research consists of all members of the CREE during April-may 2004. At that time there were 308 certified European ergonomists. The CREE provided a list of names, email addresses, and telephone numbers of all ergonomists. Since the contact information of 53 ergonomists was not correct, 255 ergonomists could be reached by e-mail. From this group 130 persons responded by filling out the questionnaire, which corresponds to a response rate of 51.0%.

### Hypotheses on Acceptance and Success

Based on the conceptual model presented in Figure 1, 10 hypothesis on factors contributing to the acceptance and success of ergonomists were formulated and tested:

Acceptance:

1. Ergonomists in a manufacturing branch will perceive more acceptance for their ergonomics work than ergonomists in a service branch.
2. Ergonomists with more years of experience will perceive more acceptance for their ergonomics work than ergonomists with less years of experience.
3. Ergonomists who use different methods for gathering information will perceive more acceptance for ergonomics work than ergonomists who use only one method.

Success:

4. External consultant ergonomists will perceive more success than internal ergonomists or researchers.
5. Ergonomists in a manufacturing branch will perceive more success than ergonomists in a service branch.

6. Ergonomists who cooperate with other professionals will perceive more success than those who work alone.
7. Ergonomists who cooperate with different departments of an organization will perceive more success than those who work alone.
8. Ergonomists who have more knowledge will perceive more success than those with less knowledge.
9. Ergonomists with more years of experience will perceive more success than ergonomists with less years of experience.

Acceptance and success:

10. Ergonomists who perceive much acceptance will perceive more success than those ergonomists who perceive less acceptance.

The hypotheses were tested using correlation and regression analysis.

## ***Results***

### **Position of ergonomists (descriptive study)**

#### *Demographics*

71% of the respondents were male and 29% female. 35% ergonomists are in the age category 46 -55 years, 33% in the category 36 –45 years, 18% in category 56 – 65 years, and 12% in the category 26 – 35 years. No respondent was younger than 26, and only 2% was older than 65 years.

The respondents group consisted of Brits (22%), Dutchmen (16%), Frenchmen (10%), Germans (10%), Belgians (7%), Italians (6%), Swiss (6%), Swedes (5%), Portuguese (4%), Irishmen (3%), and Norwegians (2%). The Finish, Greek, Luxembourg, and Brazilian nationalities were represented by a single person each.

10% of the respondents had a Bachelor degree, 54% a Master's degree and 36% a PhD degree. Most respondents (79%) had more than ten years of experience as ergonomists, 18% respondents had five to ten years of experience and only 2% had two and a half to five years of experience. None of the respondents had less than two and a half years of experience. Most respondents (61%) were CREE member for five to ten years.

### *Employer and employment*

Table 2 shows that 62% of the respondents were external consultants/advisors, and 13% company ergonomists. 15% of the ergonomists are researcher and 4% teacher. The remaining current positions of ergonomists are policy maker (4%), product developer/designer (2%) and production developer/designer (1%).

Consultant/advisors	62%
Researcher	15%
Company Ergonomist	13%
Teacher	4%
Policy maker	4%
Product developer/designer	2%
Production developer/designer	1%

Table 2. Current position of certified European ergonomist

61% of the ergonomists work in a private organization, 29% in a public organization and the remaining 11% in a combination. The majority of the consultants/advisors (77%) work in a private organization, and the majority of researchers (84%) work in a public organization. 67% of the respondents worked in a service branch and 33% in a manufacturing branch.

87% of the respondents have a full time employment. 43% of the ergonomists spend 80-100% of their working time on ergonomics, 25% between 60 and 80%, 19% between 40 and 60%, and 13% less than 40%.

Most respondents (28%) work in health and safety departments, followed by Research and Development (17%), Design (5%), General Management (5%) and Production (2%). The remaining respondents work in other departments, or in more than one department at the same time. Ergonomists are not employed in departments like marketing, purchasing, planning, quality control, finance, IT, facilities, and human resources.

24% of the respondents report an income between 40.000 and 60.000 Euros, and 23% and income between 60.000 and 80.000 Euros. 7% of the respondents had an income above 100.000 Euros.

*Ergonomics work*

Figure 2 shows with which *departments* ergonomists have cooperated during the last year in organizations for which the ergonomists does ergonomics work.

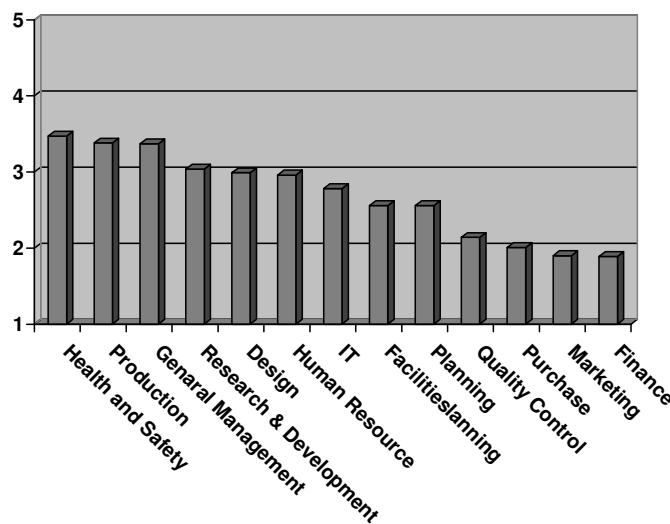


Figure 2. Cooperation of ergonomists with different *departments* (mean score on a 5 point scale from “never” to “always”)

Mostly, ergonomists cooperate with Health and Safety departments, Production departments and General Management.

Similarly, Figure 3 shows with which *professionals* the ergonomist cooperates. Ergonomists most often cooperate with engineers, safety experts and designers, and less with health professionals. Also the cooperation with professors from universities is common.

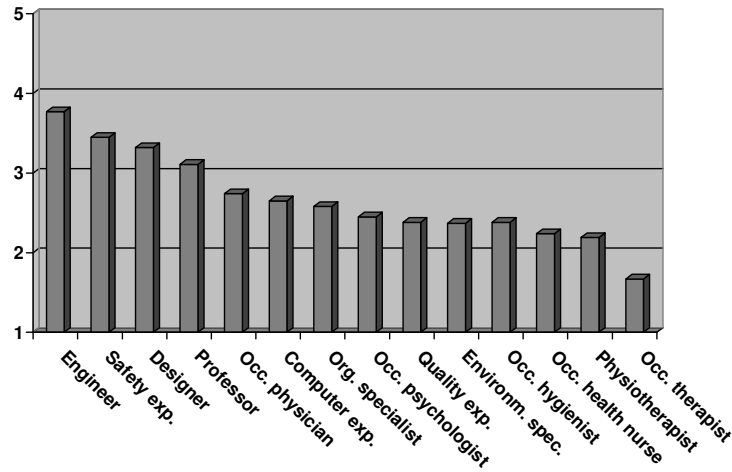


Figure 3. Cooperation of ergonomists with different *professionals* (mean score on a 5 point scale from “never” to “always”)

Figure 4 shows that the ergonomists work more on problem analysis and developing a solution, than on implementing solutions and evaluation of the implemented solution.

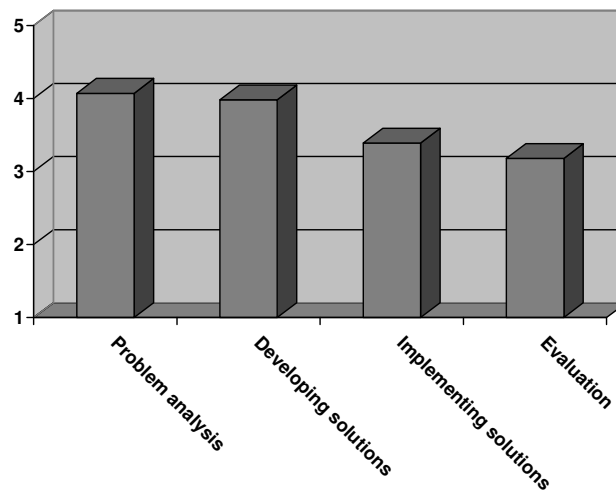


Figure 4. Type of activities of ergonomists (mean score on a 5 point scale from “never” to “always”)

Figure 5 shows that ergonomists spend more time on physical ergonomics (44%) (human anatomy/physiology, anthropometrics, physical work environment (e.g. lighting, noise), etc), than on cognitive ergonomics (mental processes, such as perception, memory, reasoning, human-computer-interaction, etc.) and organizational ergonomics (optimisation of socio-technical systems, incl. organizational structures, policies, and processes, etc.), 25% and 27% respectively.

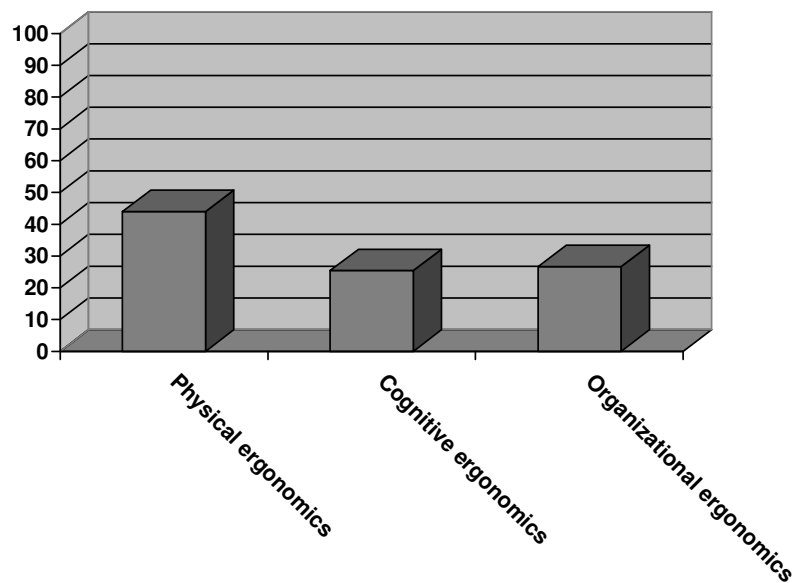


Figure 5. Percentage of time that the ergonomist spend on physical, cognitive and organizational ergonomics (mean percentage).

Figure 6 shows that ergonomists primarily use ‘soft methods’ rather than ‘hard methods’. Observation techniques, interviews, expert opinion, questionnaires, and checklists, are more popular than real models, mock-ups, prototypes, cost-benefit analysis, and computer models and simulation.

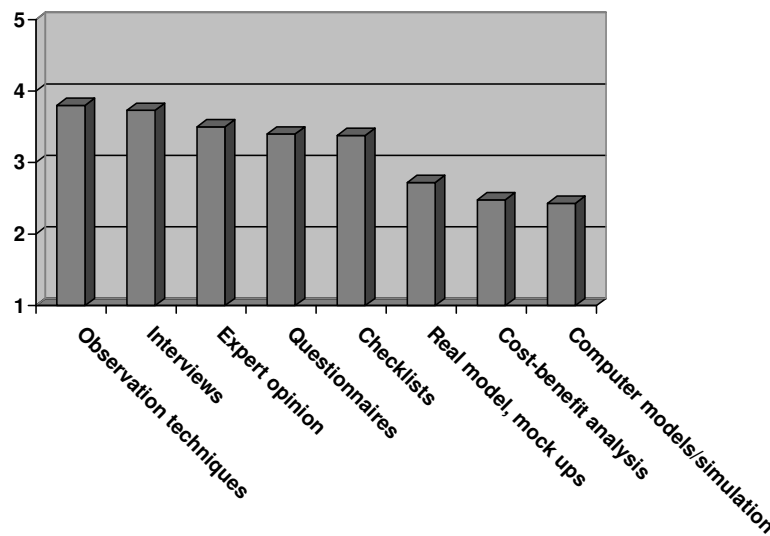


Figure 6. Methods used by ergonomists (mean score on a 5 point scale from “never” to “always”).

As shown in Figure 7, several partners are involved in the ergonomics work of the ergonomist. (e.g. participation in a project team). In particular workers, supervisors, specialists, and senior management were involved.

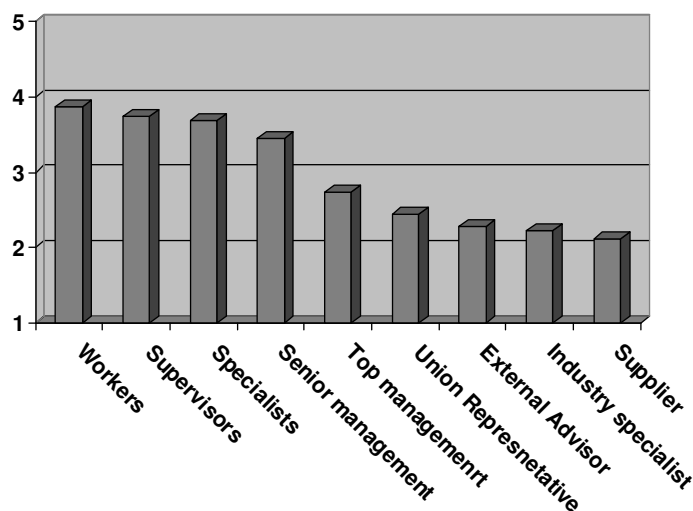


Figure 7. Partners involved in the work of the ergonomists (mean score on a 5 point scale from “never” to “always”).

*Success of ergonomics work*

91% of the respondents reported that the technical changes (e.g. new designed workplace) resulting from their ergonomics work was successful. Also individual changes (e.g. training) were considered successful by 86% of the respondents. However, organizational changes (e.g. organization of work, processes) were considered successful by only 49% of the respondents.

The success had an impact on individual workers (reported by 55% of the respondents), departments/units (45%), a whole organization (51%) a group of organizations (26%), the nation (10%) and the world (5%).

Table 3 shows the social goals that were reached by the ergonomists. More comfort and better work satisfaction were the most important social results.

More comfort	3.5
Better work satisfaction	3.4
Reduced physical workload	3.3
Improved worker health	3.3
Improved motivation	3.3
Less pain and complaints	3.2
Improved safety	3.2
Reduced mental workload	3.0
Less injuries	2.9

Table 3. Social goals reached by ergonomists (mean score on a 5 point scale from “never” to “always”).

Table 4 shows the economic goals that were reached by the ergonomists. Reduced human and system errors, and increased productivity were the most important economic results.

Reduced human and system errors	3.1
Increased productivity	3.1
Increased product quality	3.0
Increased flexibility	2.9
Increased innovativeness	2.9
Decrease in lost work time	2.9
High return on investment	2.8
Reduced sick leave	2.7
Reduced injury cost	2.7
Cycle time reductions	2.5
Drop in labour turnover	2.3

Table 4. economic goals reached by ergonomists (mean score on a 5 point scale from “never” to “always”).

#### *Acceptance of ergonomics work*

Figure 8 shows the importance of support from different stakeholders (left bar) and the support and resistance that are received from these stakeholders. Support from all stakeholders is considered important. But there is some discrepancy between required support and received support. Most support and least resistance come from workers. Most resistance comes from middle managers, in comparison to supervisors and senior managers.

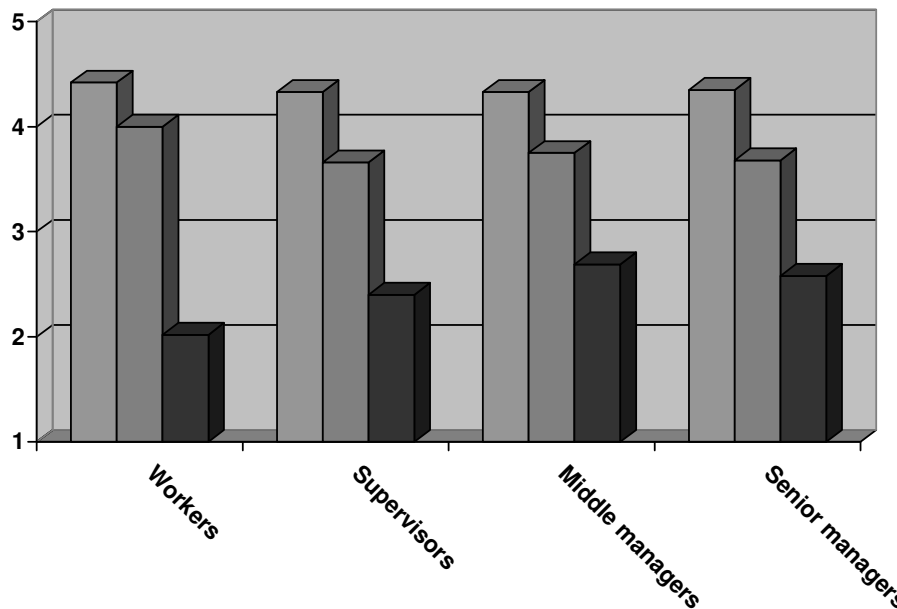


Figure 8. Importance of support (left bar) and received support (middle bar) and received resistance (right bar) from different stakeholders, as perceived by ergonomists (mean score on a 5 point scale from “never” to “always”).

Figure 9 shows that ergonomists cope with resistance in different ways. They provide more information, use a participative approach, inform stakeholders about ergonomics, and provide more advice and training. They usually do not ignore the resistance.

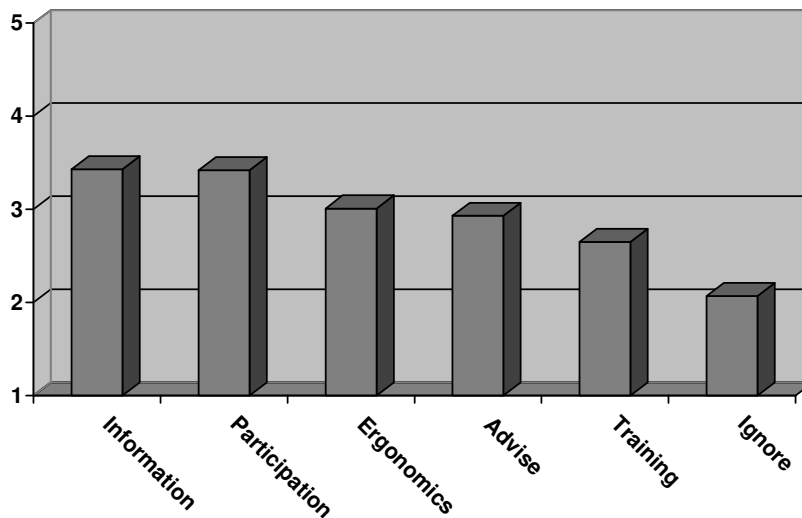


Figure 9. Coping with resistance (mean score on a 5 point scale from “never” to “always”).

Helander (1999) mentioned 7 common reasons not to implement ergonomics. The ergonomists perceived these also as reasons for low acceptance of ergonomics, in particular that ergonomics is considered too late in the design process (Table 5).

Organizations first design the technical system and then consider ergonomics	3.7
People think that ergonomics is to design chairs	3.1
People think that ergonomics is only common sense	3.1
Laboratory and field experiments take too long and are too costly	3.1
The research in ergonomics is too abstract for employees to be useful	2.7
People are adaptive, so there is no need for ergonomics in design of systems	2.6
The theoretical information in handbooks cannot be used for design	2.6

Table 5. Reason for low acceptance of ergonomics (mean score on a 5 point scale from “never” to “always”).

*Sources of ergonomics information*

Ergonomists most frequently use direct contact with other ergonomists, and books as sources of information (Figure 10).

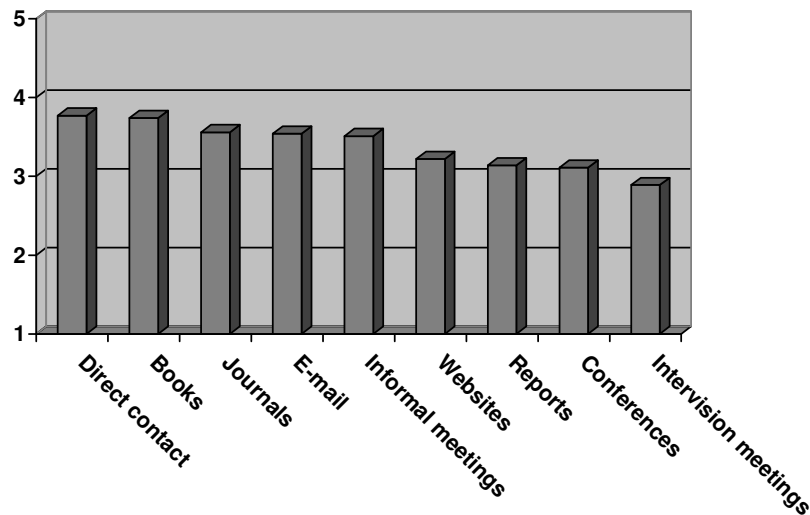


Figure 10. Sources of ergonomics information used by ergonomists (mean score on a 5 point scale from “never” to “always”).

Table 6 shows the reading frequency of international Ergonomics journals. Applied Ergonomics (scientific journal). The newsletter of the International Ergonomics Association is also read frequently. Some journals are rarely read.

Applied Ergonomics	3.0
Ergonomics International	2.5
Ergonomics	2.3
Human Factors	2.3
International Journal of Industrial Ergonomics	2.3
Human Factors and Ergonomics in Manufacturing	1.9
Occupational Ergonomics	1.9
International Journal of Cognitive Ergonomics	1.7
Theoretical Issues in Ergonomics Science	1.7
International Journal of Occupational Safety and Ergonomics	1.5

Table 6. Reading frequency of international ergonomics journals (mean score on a 5 point scale from “never” to “always”).

Figure 11 shows that different types of standards and guidelines are frequently used by ergonomists. Company standards are used less then other types of standards and guidelines.

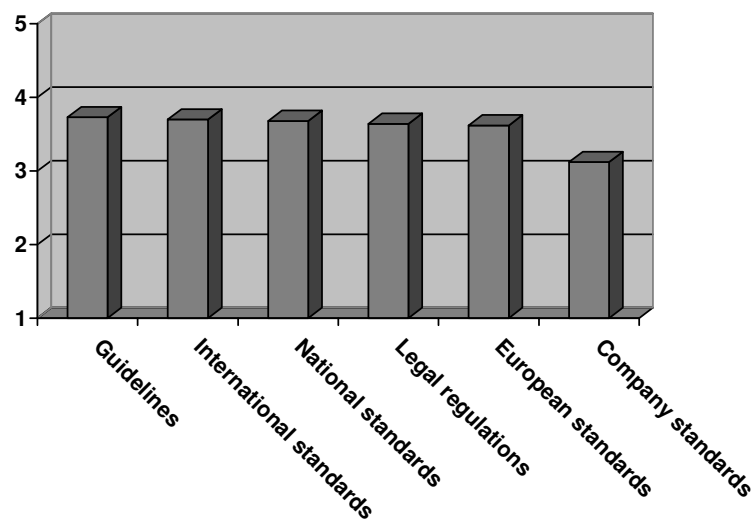


Figure 11. Use by ergonomists of ergonomics standards, legal regulations and guidelines from books etc. (mean score on a 5 point scale from “never” to “always”).

**Factors related to Acceptance and Success of ergonomists (explanatory study)**

Table 7 shows the correlation matrix between the independent variables 3-7, and the dependent variables 1-2. Definition of these variables can be found in Table 1. All independent variable except for Years of experience are correlated with Success, and Branche of industry is correlated with Acceptance.

	Variables	Mean	Std. Deviation	1	2	3	4	5	16
1	Success	2,60	0,85						
2	Acceptance	1,36	1,09	0,22					
3	Branch of industry	1,67	0,47	-0,22	-0,45				
4	Cooperation with professionals	2,38	0,65	0,51	0,06	-0,08			
5	Cooperation with departments	2,48	0,67	0,54	0,19	-0,18	0,62		
6	Knowledge	2,85	0,59	0,44	0,15	-0,08	0,42	0,36	
7	Years of experience	4,77	0,48	-0,03	0,18	-0,03	0,06	-0,05	0,01
				Correlation is significant at the 0.01 level (2-tailed).					
				Correlation is significant at the 0.05 level (2-tailed).					

Table 7. Correlation matrix between the independent variables 3-7 and the dependent variables 1-2.

The results of the hypothesis testing are shown in le 1 shows the results of testing the hypotheses are shown in Table 8.

Hypotheses:		
1	Ergonomists in a manufacturing branch will perceive more <b>acceptance</b> for their ergonomics work then ergonomists in a service branch.	Accepted / <del>Rejected</del>
2	Ergonomists with more years of experience will perceive more <b>acceptance</b> for their ergonomics work then ergonomists with less years of experience.	<del>Accepted</del> / Rejected
3	Ergonomists who use different methods for gathering information will perceive more <b>acceptance</b> for ergonomics work then ergonomists who use only one method.	<del>Accepted</del> / Rejected
4	External consultant ergonomists will perceive more <b>success</b> then internal ergonomists or researchers.	<del>Accepted</del> / Rejected
5	Ergonomists in a manufacturing branch will	Accepted / <del>Rejected</del>

	perceive more <b>success</b> than ergonomists in a service branch.	
6	Ergonomists who cooperate with other professionals will perceive more <b>success</b> than those who work alone.	Accepted / <del>Rejected</del>
7	Ergonomists who cooperate with different departments of an organization will perceive more <b>success</b> than those who work alone.	Accepted / <del>Rejected</del>
8	Ergonomists who have more knowledge will perceive more <b>success</b> than those with less knowledge.	Accepted / <del>Rejected</del>
9	Ergonomists with more years of experience will perceive more <b>success</b> than ergonomists with less years of experience.	<del>Accepted</del> / Rejected
10	Ergonomists who perceive much <b>acceptance</b> will perceive more <b>success</b> than those ergonomists who perceive less acceptance.	<del>Accepted</del> / Rejected

Table 8. Results of the hypothesis testing on factors contributing to acceptance and success of European Ergonomists.

It turns out that ergonomists working in a manufacturing branch will perceive more acceptance (hypothesis 1) for their ergonomics work and perceive more success (hypothesis 5) than ergonomists in a service branch. Ergonomists who cooperate with professionals concerning ergonomics (hypothesis 6) and those who cooperate with different departments of an organization (hypothesis 7) perceive more success than those who work alone. Ergonomists who have more knowledge will perceive more success than those with less knowledge (hypothesis 8). The other hypotheses were rejected.

## ***Conclusions***

This study describes for the first time the demographics, employment, ergonomics work, successes, acceptance, and sources of information of European ergonomists, certified on the basis of criteria set by the Centre for Registration of European Ergonomists (CREE). Most certified ergonomist are external consultants. They experience their work as successful, and reach both social goals (like more comfort and better work satisfaction) and economic goals (like less human errors and more productivity).

The success of the ergonomist may be enhanced by strengthening the cooperation with different departments, and different professionals in the organizations that they work for, as well as by having up to date ergonomics knowledge.

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