

Comparison of professional improvement and current knowledges of mechanical engineers in the USA and Serbia

Rezime: This paper presents the results of the research which has been carried out with the aim to objectively monitor the level of professional training and professional competency of engineers in Serbian companies. The research has been carried out through a survey in which the engineers from Serbia have been asked to respond to the same questions as those in the USA. This survey has made possible comparison of activities and current knowledge of engineers in the USA and Serbia, as well as the level of support of top management concerning education of employees in both countries. Generally, the obtained results do not differ considerably from the expected ones. There are some differences between American and Serbian experts, but it is encouraging that Serbian experts do not lag behind substantially when compared to their American colleagues. The principal difference seems to be in the fact that companies in the USA invest more in professional training of their employees than the ones in Serbia, as well as that American engineers are far more engaged in activities of professional associations than engineers from Serbia.

Ključne reči: knowledge, education, engineers, Serbia, USA.

Summary: U radu su prikazani rezultati istraživanja koje je sprovedeno u cilju objektivnog praćenja nivoa profesionalnog treninga i profesionalne kompetencije inženjera u preduzećima u Srbiji. Istraživanje je sprovedeno preko ankete u kojoj su inženjeri iz Srbije odgovarali na ista pitanja kao i inženjeri u SAD. Ova anketa je omogućila komparaciju aktivnosti i aktuelnog znanja inženjera u SAD i Srbiji, kao i stepena podrške top menadžmenta za obrazovanje zaposlenih u obe zemlje. Generalno, dobijeni rezultati ne odstupaju mnogo od očekivanih. Postoje razlike između američkih i srpskih stručnjaka, ali ohrabruje to što stručnjaci u Srbiji ne zaostaju mnogo u odnosu na stručnjake u SAD. Glavne razlike su to što preduzeća u SAD mnogo više ulažu u stručno usavršavanje svojih zaposlenih, kao i to što su inženjeri u SAD daleko više angažovani u stručnim asocijacijama u odnosu na inženjere u Srbiji.

Keywords: znanje, obrazovanje, inženjeri, Srbija, SAD.

* Rad je primljen 20. septembra 2010. godine i na zahtev recenzenata, bio je jednom na reviziji kod autora

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1. INTRODUCTION

In the last few decades knowledge in the field of engineering has been rapidly increased. In order to stay current and competitive in their work engineers are faced with a great challenge: continual education and maintenance of requested knowledge level necessary for successful job performance. The questions such as – in what degree engineers are engaged in refreshment of their knowledge or how much top management takes care of employees' education – are always present in this field. The questions concerning the comparison of these problems in different countries, especially the position of countries in transition versus countries with developed economies are being asked as well. These are the themes this paper deals with. Some options for comparison of business processes by applying quantification in benchmarking are given in the reference /8/.

According to /7/, science and engineering knowledge are currently doubled every 10 years. The same source states that the world has encountered exponential changes and that the greatest changes have taken place in the last 100 years. The Bureau of Labor Statistics predicts that the demand for mechanical engineers will continue to grow. Much of this growth, according to the BLS, will come from the demand for improved machinery and machine tools, as well as emerging technologies such as biotechnology, material science and nanotechnology /1/.

Engineers who do not make the effort to remain current quickly become obsolete. Some methods for educating mechanical engineers according to the distance learning concept are given in the reference /2/. While this research has looked at updating methods and motivation, not much has been done to identify the effectiveness of different forms of updating.

This paper is a continuation of the project which may help to understand what engineers can do to stay at the cutting edge of their profession and it is also an expansion of the works previously published in (/3/; /4/; /5/).

2. METHODOLOGY

The research has been carried out through the survey in which the engineers from Serbia have been asked to answer the same questions as those in the USA. /6/ This survey has made possible comparison of engagement and current knowledge of engineers in the USA and Serbia, as well as the support of top management concerning education of employees in both countries. 25 mechanical engineers from the USA and 30 mechanical engineers from Serbia have been included in the survey. All the interviewed belong to the age group between 30 and 45 years of age and they are all employed in companies. The research lasted three months, approximately in the period between September 1 and December 1, 2009.

The following four obsolescence indicators (OI) have been analyzed in the survey:

- a) How well do you understand current technical literature in your field?
- b) How often do your colleagues ask for your professional help?
- c) How often do you participate in important projects or / and in making key decisions?
- d) To what degree do you consider yourself current in your field?

The first three indicators are provided by Willis and Dubin. /9/ The last indicator used in this research is subjective, but can provide equally important insight. The interviewed have given marks to indicators from 1-5.

Obsolescence indicators have been viewed in relation to the following five updating trends (UT):

- UT1: What is the amount of financial support that you are given for your professional improvement from your company? (more than 1000 euros per year / less than 1000 euros per year)
- UT2: Have you attended professional courses in the last 3 years (yes/n)
- UT3: Do you read current professional journals, published in the last 5 years, on regular bases (at least once a month)? (yes / no)
- UT4: Are you the member of any professional association? (yes / no)
- UT5: How much time per week do you spend improving yourself professionally? (more than 4 hours per week / less than 4 hours per week)

The methodology of the survey has been carried out in this way: for each updating trend (separately) the obsolescence indicators have been analyzed depending on the characteristics of the considered updating trend. For example, for the fourth updating trend (4. Are you the member of any professional association?), the engineers from the USA are examined first – they answer “yes” and then for this group of the interviewed the average marks are found, separately for each out of four obsolescence indicators. After that the engineers from the USA who say “no” for the same updating trend are examined and, again, the average marks separately for each out of four obsolescence indicators are found as well. The same procedure is done for the engineers in Serbia. For all groups of the interviewed the same procedure is done for each updating trend separately. In this way we get ten graphs (two for each updating trend) where all obsolescence indicators among the engineers from the USA and the engineers from Serbia can be seen.

3. RESULTS

3.1. Updating Trend 1: Employer Financial Support

In the graphs 1 and 2 the research results for Updating Trend 1 are presented for mechanical engineers from the USA and mechanical engineers from Serbia.

The interviewed were divided in two groups – those, who were given more than 1000 euros per year from their company for professional training and those who were given less than 1000 euros per year. In the USA, 19 out of 25 interviewed engineers had more than 1000 euros per year and 6 engineers were given less than 1000 euros per year while in Serbia only 4 out of 30 engineers had received more than 1000 euros per year. Companies in the USA invest much more in professional development of their employees.

The results for obsolescence indicators (OI) are expected and uniform. It means that those interviewed who were given more than 1000 euros per year for their professional training mostly have somewhat higher marks for OI. The greatest exception represents the result for OI d) concerning engineers in Serbia which may be the consequence of a small number of the interviewed Serbian engineers with more than 1000 euros per year (only 4).

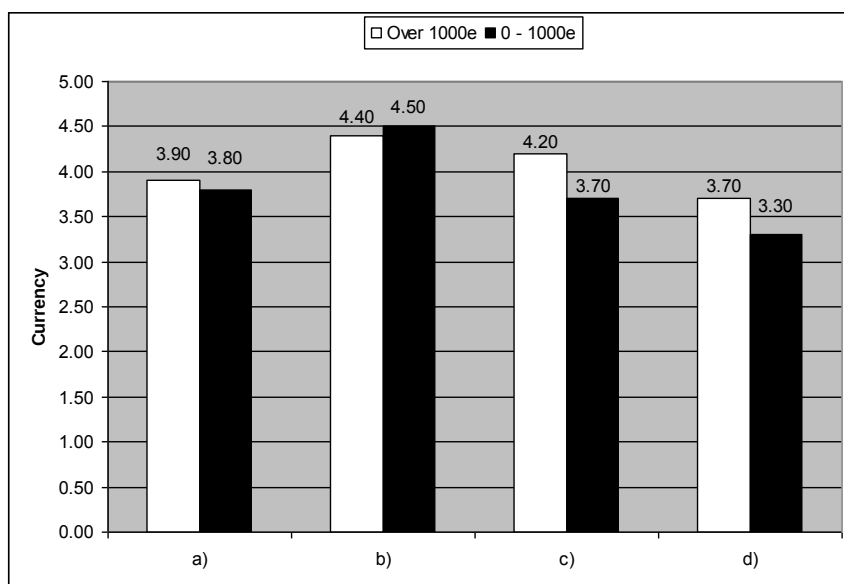


Figure 1 Mechanical engineers from the USA - Updating Trend 1: Employer Financial Support

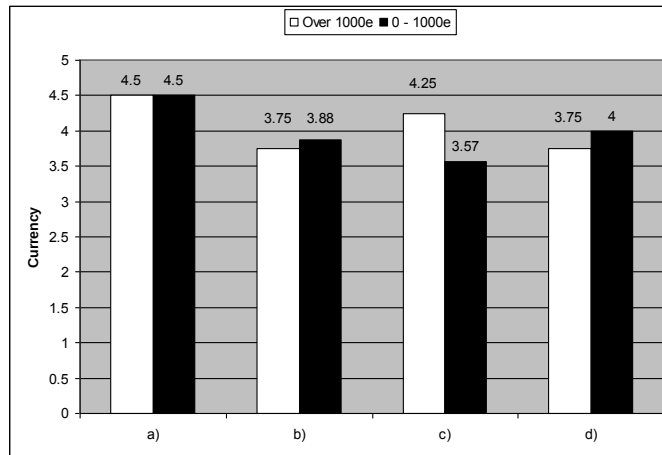


Figure 2 Mechanical engineers from Serbia - Updating Trend 1: Employer Financial Support

3.2. Updating Trend 2: Formal College Courses

Pictures 3 and 4 present the research results for Updating Trend 2, for mechanical engineers from the USA and mechanical engineers from Serbia.

The interviewees are divided in two groups - those who have attended professional courses in the last 3 years and those who have not. In the USA, 14 out of 25 interviewed engineers have attended these courses in the last 3 years. In Serbia, 24 out of 30 engineers have attended such courses. On the basis of these facts it can be concluded that more engineers from Serbia attend professional courses than their colleagues in the USA. This may be the result of recent privatization of Serbian companies.

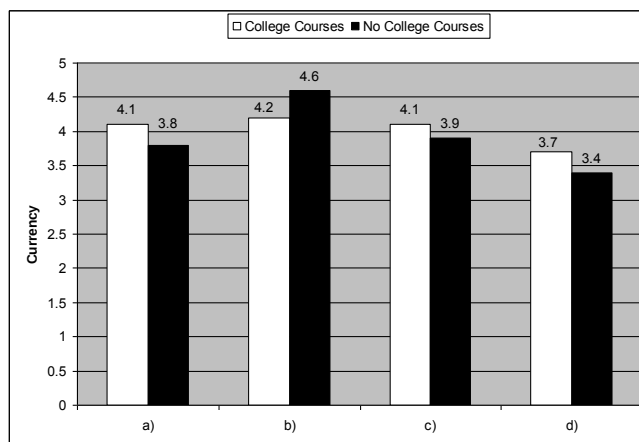


Figure 3 Mechanical engineers from the USA - Updating Trend 2: Formal College Courses

The results for obsolescence indicators (OI) are expected and uniform. It means that the interviewed who have attended professional courses in the last 3 years mostly have somewhat higher marks for OI. The only exception is the result for OI b) concerning engineers in the USA.

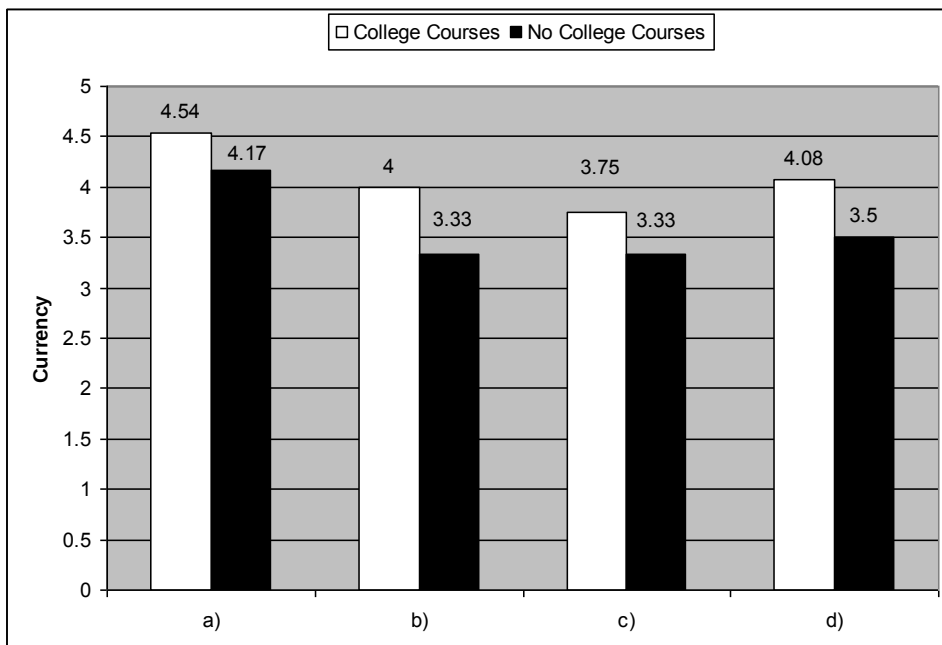


Figure 4 Mechanical engineers from Serbia - Updating Trend 2: Formal College Courses

3.3. Updating Trend 3: Reading Technical (Management) Journals

Pictures 5 and 6 present the research results for Updating Trend 3, for mechanical engineers from the USA and mechanical engineers from Serbia.

The interviewees were divided in two groups – those who read current professional journals (published in the last 5 years) on regular basis (at least once a month) and those who do not read these journals at all. In the USA, 20/25 interviewed engineers read current professional journals on regular basis, while in Serbia 24/30 engineers regularly read such journals. It can be noticed that, in relation to reading current professional journals, American and Serbian engineers are uniform.

The results for obsolescence indicators (OI) are uniform and expected for the interviewees who read current professional journals on regular basis – they mainly have somewhat higher marks for OI. The only exception is the result for OI d) found in the answers of the engineers from Serbia.

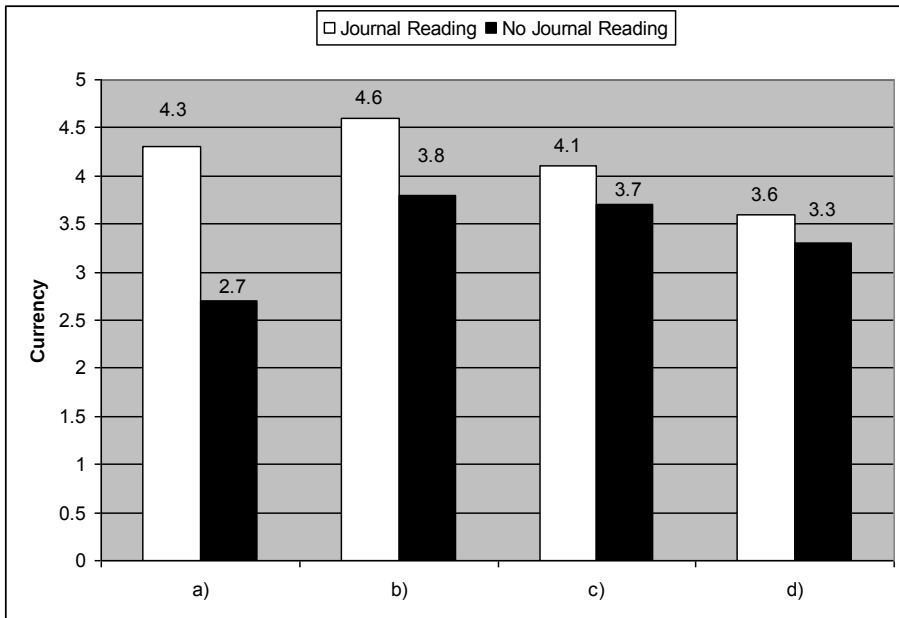


Figure 5 Mechanical engineers from the USA - Updating Trend 3: Reading Technical Journals

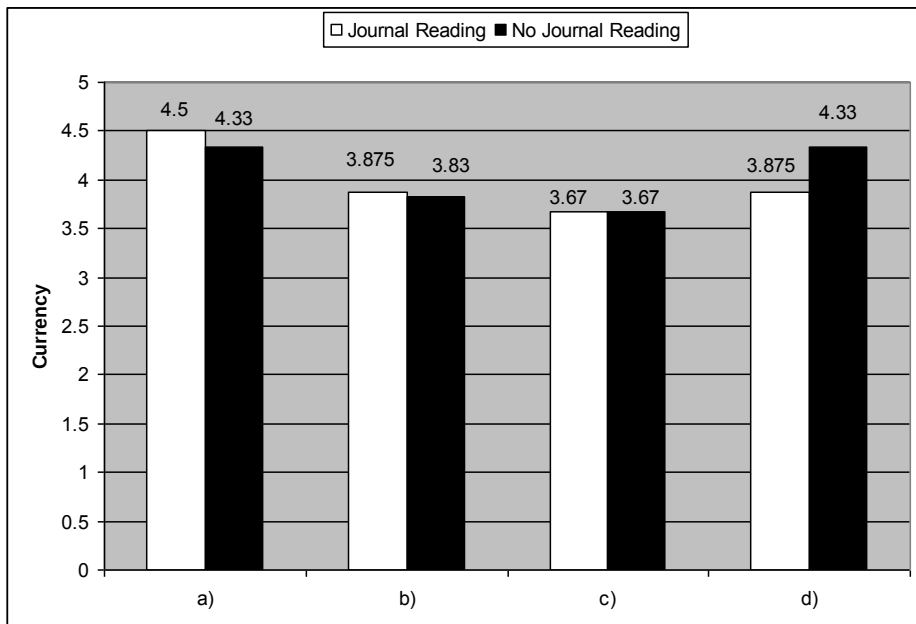


Figure 6 Mechanical engineers from Serbia - Updating Trend 3: Reading Technical Journals

3.4. Updating Trend 4: Professional Society Membership

Graphs 7 and 8 present the results for Updating Trend 4, for mechanical engineers from the USA and mechanical engineers from Serbia.

The interviewees were divided in two groups – those who are members of some professional associations and those who were not. In the USA 22/25 interviewed engineers are members of some professional associations. In Serbia only 10/30 engineers belong to professional associations. Comparing to their colleagues in Serbia, engineers in the USA are far more engaged in activities of their professional societies.

The results for obsolescence indicators (OI) are uniform and expected – the interviewees who are members of some professional associations mostly have higher marks for OI. The only exception is the result for OI b) found in the answers of the engineers from the USA.

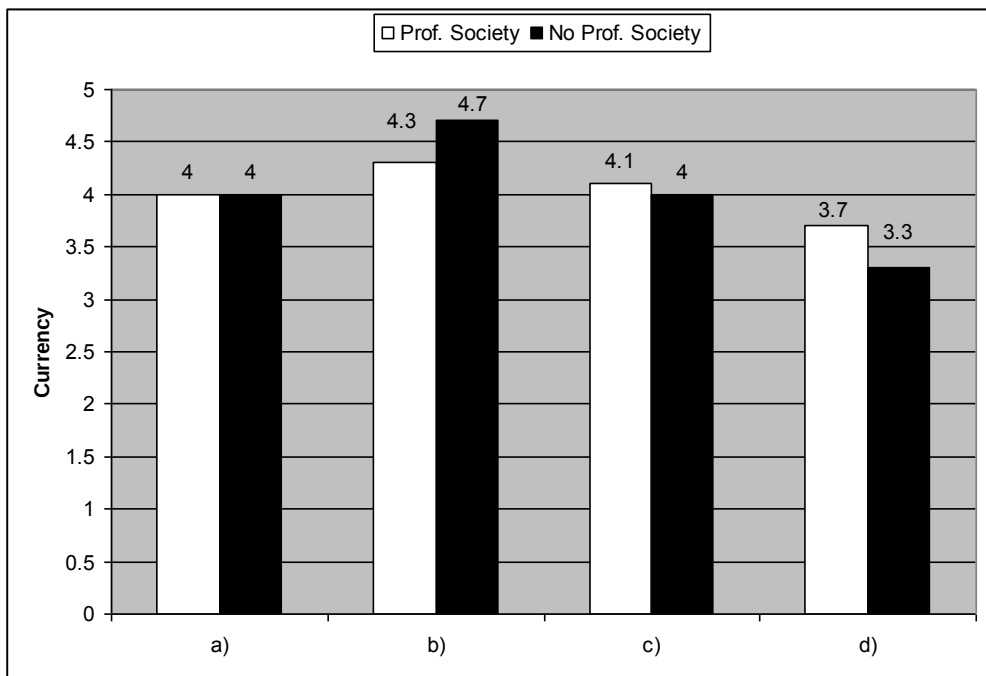


Figure 7 Mechanical engineers from the USA - Updating Trend 4: Professional Society Membership

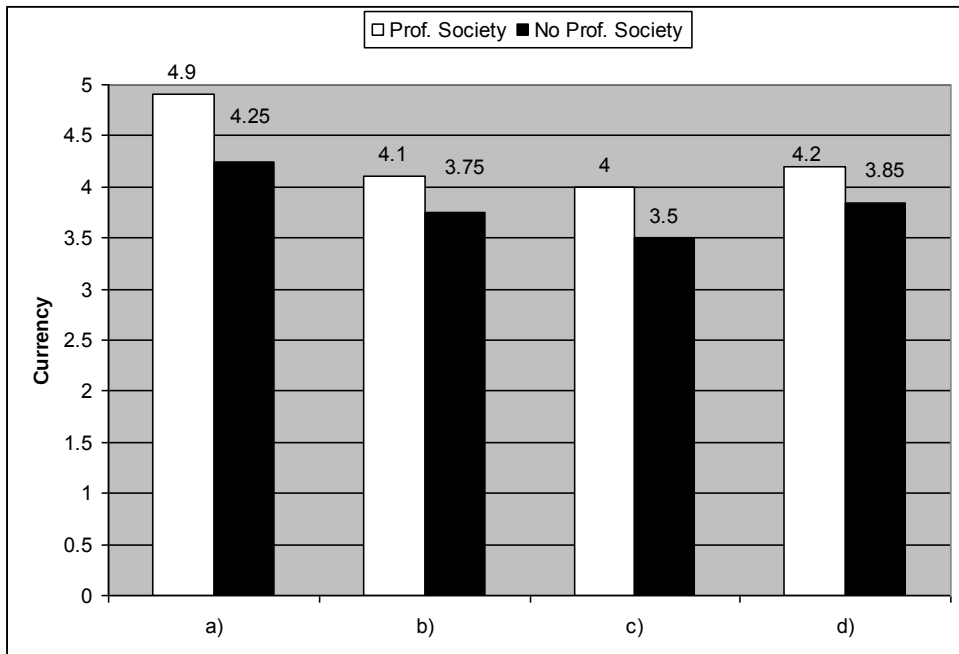


Figure 8 Mechanical engineers from Serbia - Updating Trend 4: Professional Society Membership

3.5. Updating Trend 5: Time Spent on Technical Development

Graphs 9 and 10 present the research results for Updating Trend 5, for mechanical engineers from the USA and mechanical engineers from Serbia.

The interviewed are divided according to the quantity of time they devote to professional improvement per week (more than 4 h per week / less than 4 h per week). In the USA, 16/25 interviewed engineers devote more than 4 h per week to professional improvement. In Serbia, 22/30 engineers spend more than 4 h per week on professional improvement. Here again, American and Serbian engineers are almost uniform concerning the amount of time they devote to their professional improvement.

The results for obsolescence indicators (OI) are expected and uniform. The interviewed who spend more time per week on professional improvement have somewhat higher marks for OI.

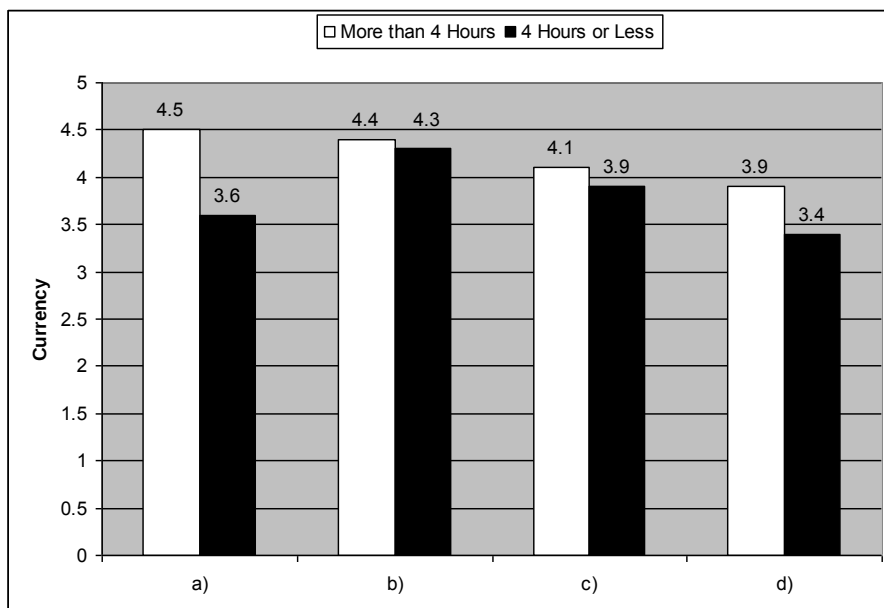


Figure 9 Mechanical engineers from the USA - Updating Trend 5: Time Spent on Technical Development

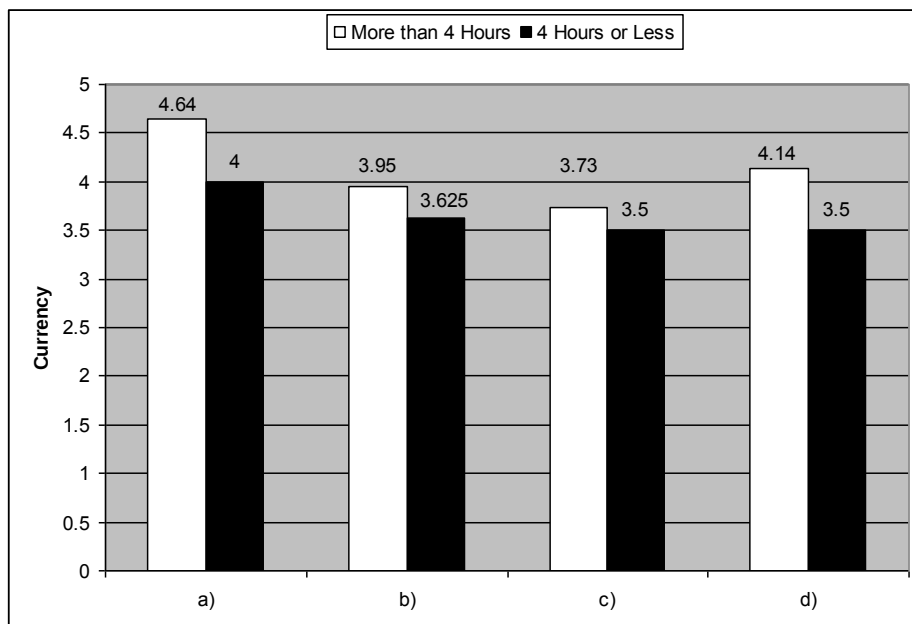


Figure 10 Mechanical engineers from Serbia - Updating Trend 5: Time Spent on Technical Development

4. CONCLUSIONS

When American engineers are compared to their Serbian colleagues, the research has shown the following:

- Companies in the USA invest much more in professional development of their employees.
- Engineers in Serbia attend professional courses more than engineers in the USA.
- American and Serbian engineers are uniform with regard to their regular reading of current professional journals with regard to the cutting edge of developments in the field.
- Engineers in the USA are far more actively engaged in professional associations than are Serbian engineers.
- According to the time they devote to professional improvement per week, there is the uniformity in behavior between American and Serbian engineers.

The results for obsolescence indicators (OI) are expected and uniform – which means that the interviewed experts, who had better results for updating trends, mostly have somewhat higher marks for OI. There are several exceptions which are mostly related to OI b) concerning American engineers and OI d) concerning Serbian engineers.

Concerning American engineers, the most positive influence on OI have UT3 – regular reading of current professional journals and UT5 – weekly time spent on professional improvement. The least positive influence on OI is reflected by UT4 – membership in professional associations.

Concerning Serbian engineers, the most positive influence on OI have UT2 – attending professional courses and UT4 – membership in professional associations while the least positive influence on UT3 – represents regular reading of current professional journals. This result is quite opposite in the USA.

Generally speaking, the obtained results do not differ much from the expected ones. There are certain differences between American and Serbian engineers but it is encouraging to establish that Serbian engineers do not lag behind in comparison to their American colleagues. There are also possibilities for further research efforts in this domain, first of all concerning the number of interviewees and considering more obsolescence indicators and updating trends.

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