Development of Workforce Competence Assessment System by Sectors and Regions

Observations & Suggestions

Foreign Expert Report

Author: Govert Claus
Company: Noblesse Oblige (The Netherlands)
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Contents

1 Introduction

The Bulgarian Industrial Association has started a program called "Development of Workforce Competence Assessment System by Sectors and Regions". This program started in 2009 and is running until the end of 2013.
As part of this program, foreign experts are invited on several occasions, to evaluate the program and share their knowledge and experience. Based on my experience with web based information systems, competence management and e-portfolio models, I was considered an expert, and had the privilege of visiting the program.
In the week of 10-14 October, Kate Tetley (expert on sector skills models from Scotland) and I were in Sofia. We met the project members, representatives of the trade unions, employers, representatives of the involved ministries and involved professors from the university. We had the opportunity to share our experience with similar projects and discuss freely all aspects of the program. It struck me how open all involved people were. No issues were avoided, every idea was taken seriously, and we were given all the time needed. That made it possible to get a good insight in the program.
In this report, I will share my observations, comments and suggestions with the project team. I will do so in the following structure:

- Chapter 2 covers the project organisation. This was not really the main area of interest, and therefore I will only briefly state my observations.
- Chapter 3 discusses the model used to structure the competences, skills and positions.
- Chapter 4 is about the information systems. This is my main area of expertise, and will therefore be the most elaborated part of the report.
- Chapter 5 deals with the situation after the program ends: how can be assured that the system will be used to its benefit in the future?
- Finally, the conclusions and recommendations will be listed in chapter 6.

2 Project organisation

Although my primary focus is on information systems, I need to go into the project organisation, first. Project goals and strategy set the conditions for the information systems.
In this chapter, I will briefly go into the project goals, the way knowledge and experience are collected, the way support for the program is build, and the expectations that are raised by the program.

2.1 Goals

The project states its goals as follows:
"The overall project objective it to enhance labour market adaptability and effectiveness, as well as to strike a greater balance of labour market demand and supply by developing a system for workforce competence assessment by sectors and regions."[1]
This is an ambitious goal! But the program is large enough to take on a goal like this. It does make the program elaborate and complex: you must deal with a lot of stakeholders with their own interests. You must also deal with all different sectors and regions, with their own jargon, culture, interests, processes, etc.
You can handle with this in two ways:

1. Develop a central model and make everybody comply with it. This will only work if you have something to convince everybody to participate. This "something" could be legislation, money or force, but also a sense of urgency (such as a desperate situation). Money or legislation will not convince most organisations intrinsically, and will probably not lead to an optimal result. A sense of urgency will convince most organisations intrinsically, and will lead to better cooperation.
   Another way of convincing organisations, is to show the benefits of the program – preferably in real life. This will lead to intrinsic motivation, too, and therefore to good results.
2. Stick with the common parts. As all stakeholders, sectors and regions deal with the labour market, they all must have something in common. This common part can be centralized. Everything specific, can be left to the specific organisations.
   Still, accepting and adopting to these common parts will require some convincing, too.

In practice it is probably best to combine these two strategies. Make sure all parties involved have a sense of urgency, and make sure not to interfere too much with specific issues.
In my opinion, the program has done very well in this regard. Through analyses and research papers, a clear sense of urgency has been sketched. The cooperation of so many organisations (unions, employers, university, ministery,

[1] From http://en.competencemap.bg/about+the+project/1/YdK3clajYNevItKTcRaDg9ejINKzYdaHMFODchOfIZK3cderYBaXINavIRKnIR

etc.) indicates that there is a sense of urgency. The model chosen, is very much aimed at local implementation, and leaves much space for specific content. However, attention must be given the benefits of the program. These benefits have been described in theory, but should be "proved" in real life. This will be done at the pilot sites...

2.2 Support

A critical success factor is having the support of all stakeholders. This does not mean that every decision or choice must be approved by all stakeholder. It does mean that all stakeholders must agree with the approach, the general ideas and the substantiation of these ideas.
It seems the program is very thorough with substantiating decisions, ideas and the approach. All stakeholders are involved: employers and employees (through unions), sector organizations, regional branches, ministries and the university. The educational organisations (schools) seem underrepresented, but setting up the a Competence Assessment System needs to be started in the labour market. Once the Competence Assessment System is in place, it is easier to convince the schools to adopt the system, and reform the education accordingly.

I think the program is doing a good job with getting the support needed. BIA has status in Bulgaria, and have the means of getting the labour market in motion. A potential problem when the system is in place, could be the ownership of the system, and the data collected in the system. With anyone of the stakeholders being the owner, the other stakeholders may not trust the system enough to use it to its full extent. This could be prevented with technical solutions, which make the system fully transparent. It is also possible to place the ownership at an organisation which is acceptable to all parties, for instance at a foundation in which all stakeholders take place.

2.3 Expectations

As mentioned in the first paragraph of this chapter, the goals of the program are very ambitious. This could either off organisations, or create false expectations. I have dealt many times with programs which were the "solutions to all problems". During the program, more and more problems were supposed to be solved by the system in development. Every time again, this caused the program to overrun in time and cost, and the results were disappointing, because not all problems had been solved. But, soon after the program was finished, a new program was started which was to solve all problems...
Therefore, make sure expectations are managed.
A way of doing this, is by regularly showing (intermediate) results, even if these results may seem not so important. When showing results make sure that the added value for the stakeholders is made explicit.
Another way of doing this, is to give the stakeholders responsibility for (part of) the results. Stakeholders are willing to do so, if the added value of the results are clear and if they have an interest in gaining (co)ownership of the results. Again, showing results on a regular basis will enable this.

3 Model

The basis of the Competence Assessment System is the model on which the system is based. In this chapter, the chosen model is discussed.

3.1 Make of Buy?

A model can be custom made, or an existing model can be reused. This can be done for the entire model, or parts of it.
In the Netherlands, all national competence assessment systems use the same compentency model for behavioural competences: the SHL framework (http://www.kwalificatiesmbo.nl/tl_files/bestanden/Poster%20SHL%20competenties%20CC%202010.pdf - in Dutch). This highly facilitates exchanging data between systems, sectors and organisations. But only the general competences are in this framework, and therefore the use of the framework is limited. In practice, the added value of using a shared competency framework is limited to career guidance and orientation. Any other service (job matching, vocational training & education, etc.) needs more detailed information.

The program chose to use a specific model for Bulgaria. I think this is a good choice, because of two reasons:

1. The model has to work in Bulgaria, with the local professions, local education, local culture.
2. The model has to be accepted by the involved employers and employees, and this is easier when using a specific model which can be sculptured to the needs and wishes of these employers and employees.

However, this can also be achieved with using a proven model, which is adapted to the local needs and wishes. In the Netherlands we used the IMS model for exchanging e-portfolios (http://www.imsglobal.org/ep/), but made a specific application profile: NTA 2035 (http://www.nen.nl/web/Werken/NTA-2035-Eportfolio-NL.htm - in Dutch). This was done by choosing what fields are relevant for the Netherlands, translating these fields to Dutch, and choosing value ranges for these fields.

3.2 Examples of Competence models

The program has already looked into many competence models, but to be complete, I mention the models I have worked with in the past years.

Model	Owner	Contents	Experience / Remarks
Kwalificatiestructuur (Qualification Structure)	COLO Association of 17 Dutch National Centres of Expertise on Vocational Education, Training and	http://www.kwalificatiesmbo.nl/cohort-2011-2012.html (in Dutch) Has 238 files,	Used in Dutch Vocational Education & Training, also partly used in Public

	the Labour Market (http://colo.nl/homepage.html)	describing the starting qualifications of 620 positions. Qualifications are gathered by the Centers of Expertise, which visit employer and companies to gather data.	Employment Services for competence tests and job search. Very elaborate and useful for education, but also quite expensive (in 10 years € 350 million).
B&O&C register	UWV Werkbedrijf (Dutch Publice Employment Service) (http://www.uwv.nl)	http://www.boc-register.nl/ (login: govert / welkom1) Contains a list of 3.000 jobs with synonyms, relation to education / jobs / competences and other registers (ISCO, SBC)	Very specific list of job names, used in all systems of UWV - crucial for exchanging data between systems. Also used by organisations that exchange job openings with UWV. Quite laborious to keep the list up-to-date.
COBRA	Belgian (Flemish) Public Employment Service (http://www.vdab.be) - based on R.O.M.E. from the French Public Employment Service (http://www.pole-emploi.fr/)	http://vdab.be/cobra 550 job description linked to skills and competences. Mainly used for career guidance.	At UWV we used this register as a basis for adding competences to the B&O&C register.
ISCO	International Labour Organisation	http://www.ilo.org/public/english/bureau/stat/isco/ In use at Dutch Public Employment Service to exchange data with international partners. Dutch job names (B&O&C register) are linked to ISCO-names.	Not in use within the Netherlands, because the names do not fit in the Dutch labour markt. However, is very useful for exchanging and comparing with international partners.
ESCO	European Commission, based on taxonomy of Swedish Public Employment Service (http://ec.europa.eu/social/BlobServlet?	Not yet publicly available	Supposed to be the solution for the European labour market, but quite complex and (too?) elaborate, and

	docId=4654&langId=en)		therefore probably not very flexible. Not yet implemented in the Netherlands, and I question whether this will be a good solution...
O-Net	US Department of Labour (http://www.onetonline.org/)	http://www.onetcenter.org/ About 1.000 general positions, related to skills, education, tasks, activities, etc.	Very elaborate model, with services ready to be used. However, aimed at the US market. In the Netherlands only used as "inspiration" for B&O&C register.

4 Information Systems

My main area of expertise is Information Systems. Therefore, in this chapter I will discuss the way the Competence Assessment System could be supported by information systems, in more detail.

4.1 Web based solution

The program had already chosen to use web based solution if any form of digital instruments were to be implemented. In my opinion this really is not a choice, but a prerequisite: as soon as more than one organisation is to use digital services, the best way of providing them, is through the internet. Using web based solutions, specific tools are no longer required at the clients site - just a browser and internet connection. And since using the internet has become very common, it will be much easier to make people use the system.

However, using web based solutions does require specific attention. In the following paragraphs I will discuss the most important issues.

4.1.1 Flexibility

Using web based solutions increases flexibility of the system. As there is no need for client-side software (except a web browser and internet connection), changes can be implemented quite easy. That is to say: technically it is easy to implement changes, but these changes have impact on all users. Often, this is not taken into consideration when developers are implementing changes.
Therefore, make sure the change management process takes into consideration the effect of changes on all the users. It is good practice with web based solutions to implement small changes on a regular basis, instead of large changes only once in a long time.

4.1.2 Security

Web based applications can be accessed through the internet, which makes them very easy to use. However, that also makes them accessible to unauthorized people. To prevent this from happening, and to prevent misuse of the application, make sure enough attention is given to security.
When using standard solutions, make sure these have the proper security settings. When making your own solutions, make sure the developers have experience with web based programming and the security issues that are involved. There are a lot of “Best Practices” around to take into consideration, and many development tools have security aspects built in.

However, just making sure that the application is secure, is not enough. Most security breaches of applications are the result of human “failure”: passwords that are compromised, employers who abuse their rights, etc. To prevent this from happening, make sure processes are in place, the right amount of logging takes place, and checks are performed regularly.
As the system will be used by a wide variety of users, organisations and maintenance people, make sure all these people have the correct access rights.

It can be useful to implement a function to report abuse of the system. Large customer systems such as Google Docs, Facebook and (in the Netherlands) Hyves, use this to track and solve possible misuse as soon as possible. However, a function like this does require somebody to process the reports!

It is good practice to adopt some standard on security, such as ISO27002 (http://en.wikipedia.org/wiki/ISO/IEC_27002) for information security. In the Netherlands there is a government organisation that specifically looks at security issues: Govcert (http://www.govcert.nl/home). One of their products is a whitepaper called "Framework for Secure Web Applications" (http://www.govcert.nl/dienstverlening/Kennis+en+publicaties/whitepapers/raamwerk-beveiliging-webapplicaties.html - in Dutch...). Internationally, the OWASP initiative (https://www.owasp.org/) shares a lot of knowledge and good practices on security.

4.1.3 Service Oriented Architecture

When setting up a web based system, it is good practice to do so in a Service Oriented Architecture. There are several reasons to do this:

- Performance: if one service requires more performance, it is not necessary to enlarge the entire system
- Reuse of functionality: functionality that is used in different places can be reused when this is captured in a service
- Flexibility: with separate services and separate layers for data, logic and presentation, it is possible to combine services on the fly
- Time to market: with separate services, one service can be changed without having to change the entire system.
- Prevent vendor lock-in: using separate services and separate layers, it is possible to use different suppliers for different services or layers.

The possibility of reusing, combining and rearranging services, it is possible to create specific services to meet specific business processes. If different sectors or regions require different business processes, these can be supported by the same system.

Setting up a Service Oriented Architecture does require a little more investment in the beginning. The different layers (databases, service bus, logic, presentation) have to be engineered and built. There are systems that offer a complete Service Oriented Architecture out-of-the-box. At UWV we used the Oracle stack: Oracle databases, Oracle Fusion Middleware, Oracle Portal - which

together form a SOA (see figure 3.1).

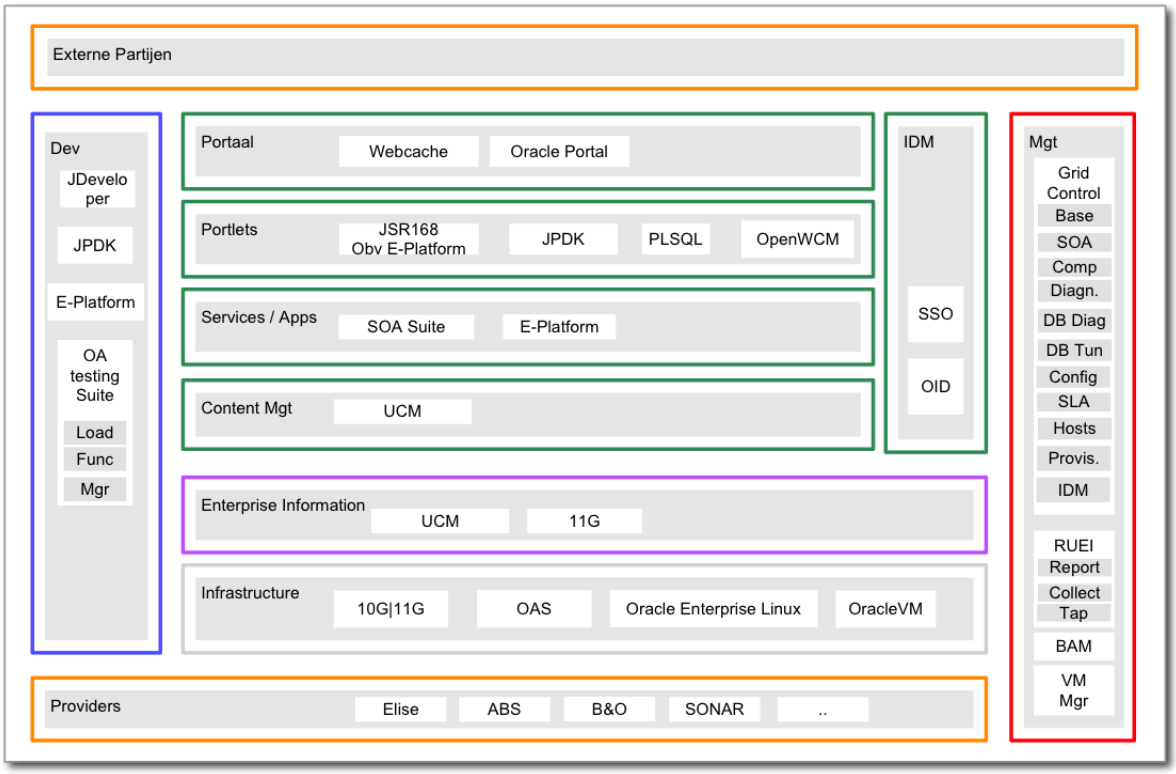

figure 3.1: SOA Architecture UWV, based on Oracle products

But JBoss (http://www.jboss.org/) offers a good open source alternative. A Service Oriented Architecture does require some "overhead" of hardware, because of the decoupling of layers. In the case of UWV, this has led to quite a large serverpark as shown in figure 3.2.

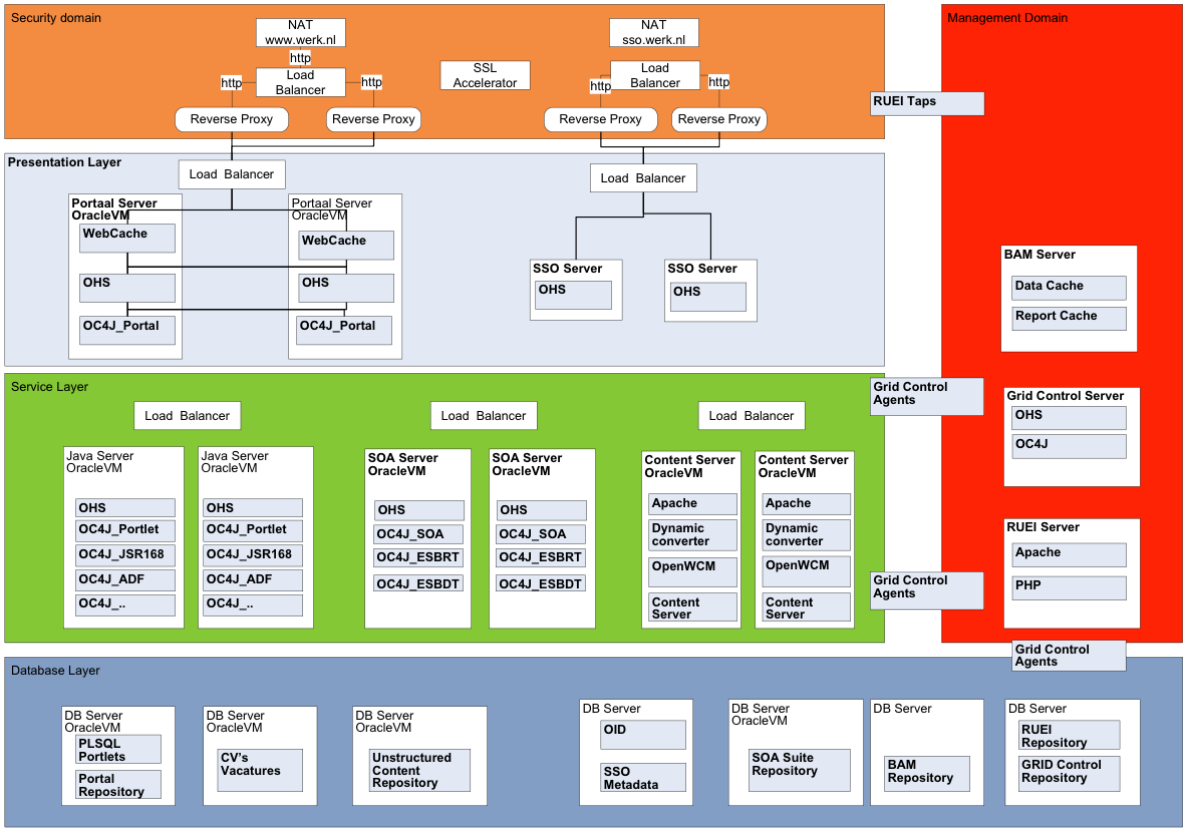

figure 3.2: Server Park UWV to support Service Oriented Architecture - each white square represents a server

A good way to deal with this, is using virtual servers. You can start with relatively small servers, and when performance is an issue, add power to the virtual servers, or add new ones.

Then you have to describe the granularity of services: how “large” are the services going to be? There should be some rule of thumb that the developers can use when designing and building the services. Too small services will lead to too many services with bad performance and high complexity, too large services will lead to loss of flexibility and suboptimal reuse of services.

Finally, there has to be a reasonably good idea of the information model. This model is to be built in the database, which is going to be the most rigid part of the architecture. Making changes in the database will effect all services based on the related data. And once in use, the database will be filled, and changing the database will most probably require transformation of existing data.

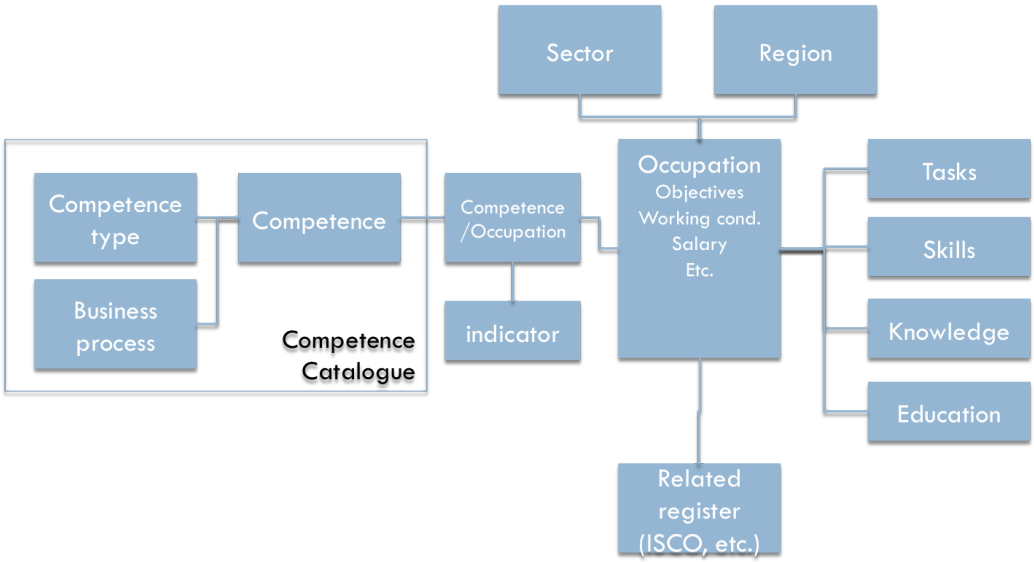

figure 3.3: example of information model

As the program has a good model, it is not so difficult to set up an information model, and deduct a data model. Still, try to stay flexible with the datamodel, and make sure that extending the model is not too difficult.

It is good practice to follow some methodology when setting up your Service Oriented Architecture. There are frameworks that can be used, but strictly following such a framework could end up with a very well governed architecture, that just does not answer to the specific situation of the Competence Assessment System. Therefore, I suggest using a framework for inspiration, but create your own specific framework.
Examples of frameworks are:

- Open Group OSIMM (http://www.opengroup.org/soa/source-book/osimm/model.htm)
- CBDi-SAE Framework from Everware (http://everware-cbdi.com/cbdi-sae-metamodel)
- Service Integration Maturity Model by IBM (http://www.ibm.com/developerworks/webservices/library/ws-soa-simm/)
- SOA Governance Framewrok by Oracle (http://www.oracle.com/us/technologies/soa/oracle-soa-governance-best-practice-066427.pdf)

4.1.4 Make or Buy?

Setting up a Service Oriented Architecture requires several components: database, service bus, application containers, portal. These components can be build custom made, bought in separate components, or bought as a "suite". Building these components is really a waste of money and time: there are good components available for good prices, or even for free. These components have standard functionality, so there is no reason why these should be custom made. Using components of different vendors, or choosing a complete suite from a single vendor, is a choice that depends of the situation. Because a Service Oriented Architecture has neatly separated layers and services, it is possible to chose different vendors for different components, and even for different services.

In practice, it is easier to implement a suite of components from one vendor. An even better reason to choose for a suite, is the single point of contact with the supplier. If more suppliers are used, they have the possibility of "hiding" behind eachother, if there are problems. They can say that the problem is not theirs, but related to the system of another supplier. Only after the entire system is fully operational and stable, it is easier to turn to other suppliers for specific components or services.

Therefore: use proven technology. It is probably easier to start with a suite from one vendor, but if not all requirements can be fulfilled, it is possible to integrate components from different vendors. In that case, make sure that responsibilities of the different suppliers are clear, or choose one supplier to deal with the different vendors.

4.2 Taxonomy or Tagging?

The information model of the Compentence Assessment System is pretty much in place. However, the model needs to be filled with data from the employers. Many fields need structured data, in order to be able to reuse them, and link them to other tables or registers. Examples of these fields are the occupation name, the competences, the indicators and education.

There are two ways of filling these fields:

1. Start with a taxonomy with a (semi) closed range of values
2. Start without a range of values, and reuse values that other users have entered

In the first case the system has to have a taxonomy on forehand. The users (employers) will have to comply to that taxonomy, and may not find the value that they think is best. On the other hand, this taxonomy can be as structured as needed, and can be linked to other registries straight away.
As there are already taxonomies for occupations and competences in other countries (ISCO, O-Net, etc.) one could think this is the right way to proceed. These taxonomies are not made for the Bulgarian situation, and in the Netherlands it turned out the ISCO list did not work well.

Start without any predefined taxonomy or list of values, has the advantage that the employers can enter the values they are used to. Later, these values can be rearranged and/or combined into a structured taxonomy, which is fully adapted to the Bulgarian labour market. This rearranging and combining does take some time and can be more difficult than anticipated, depending on how the system is filled by the employers.

Probably the best solution is to use a combination of the two. Start out with an idea of a taxonomy and a range of values - based on the input of a few employers (in a pilot?). Leave space for employers to add values, but encourage them to choose from the existing list. Use some tagging solution to collect values from the employers for a period of time or until you have collected a certain number of values.

Then, evaluate the data collected, and try to set up a more stable taxonomy. You can then decide whether to use a closed range of values for each information item, or to leave (some of) them open.

You will need enough data to be able to create a stable taxonomy. This data is to collected from employers, but I wonder if these employers will take the time to enter all the data. The employers will either need to be convinced to enter the data, or somebody else will have to do the work.
Convincing employers can be done if the system has one or more services which the employers really want to use. In the next chapter some services are mentioned. However, these services are based on the taxonomy that needs the data from the employers - a deadlock situation... To solve this, entering the data is probably best done by the assessors. These assessors, trained by the program, visit the employers during the pilots, collect the data and then enter the data in the system. Once the system has enough data to provide services, the employers start using the system and enter the data themselves.

In the Netherlands, the Public Employment Service uses a predefined taxonomy with a closed range of values for occupations. That did not work out very well: employers complained about not finding the right values. Therefore, we decided to add a field in which employers can state the occupation name of their choice. They still have to choose a value from the taxonomy in order to link the occupation to other tables and registries, but when presented the occupation name of the employer is shown.

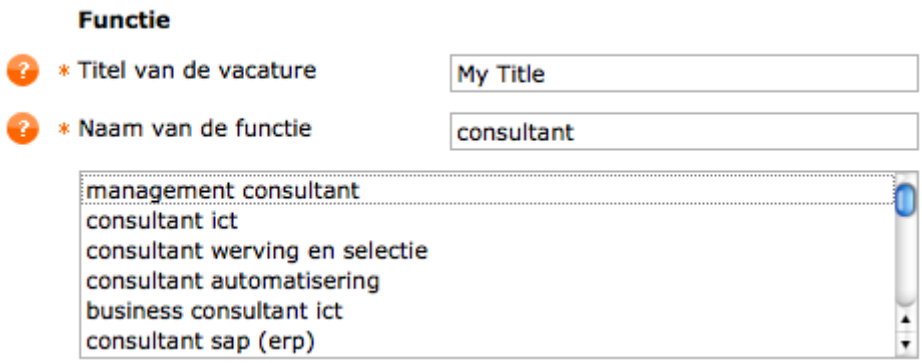

Figure 4.1: using a taxonomy (“Naam van de functie”) with the possibility to enter a free text alternative (“Titel van de vacature”) (from www.werk.nl)

4.3 Services

The program relies on employers to fill the Competence Assessment System with competences and occupations. The employers will only do so, if they get something in return!
Therefore, there have to be some services related to the Competence Assessment System. In the following paragraphs I discuss some possibilities for services that will convince employers to use the system and provide the required information. If one or more services are developed, try to focus on one “killer” app. This is one service which you know will trigger the employers to start using

the system. Then other services can be added later, if the users of the system ask for them.

4.3.1 Education and training

With the information on occupations and the related competences and skills, an educational institute can tune its training and education to the occupation. On the whole, this is one of the main goals of the program: aliging vocational education and training with the labour market. This is also true for a single employer and educational institute. Through the Competence Assessment System, educational institutes can find out what skills are required by employers. With this information they can tune their courses and training to the employers. If they can offer these courses and training through the Competence Assessment System, this can be used by the employers to find the best institutes to educate their employees.

4.3.2 Internships

Having a relationship between occupations and education, the system can also be used to find the best traineeships / internships for students. If employers get the possibility to indicate their need for trainees, students can look for employers where they can have their traineeships. Finding each other is easy if both employers and students use the same set of competences and skills.

In the Netherlands, the Qualification Structure is used for this purpose. However, this is not organised by the COLO (the national association of Centers of Exertise), but by the Centers of Expertise themselves (even though there is a national website where all internships are gathered: http://www.stagemarkt.nl). This is because employers have to meet certain conditions to provide internships. Whether they meet these conditions, is checked by consultants of the Center of Expertise. The reason these conditions are so important, is because students actually graduate at the employers. Graduation criteria are not nationally defined - there is no national exam. Each student determines his own graduation criteria, together with the school and the employer. The employer is very important in deciding whether the student graduates or not.

In the Netherlands there are two ways of obtaining vocational education:

1. BOL (Beroeps Opleidende Leerweg): on average 4 days in school and 1 day in a company. A BOL education is paid by the government if the student is of school age.
2. BBL (Beroeps Begeleidende Leerweg): at least 20 hours in a company and 1 day in school. BBL education is paid by the student or the employer, and ranges from 200 - 600 euro.

In both cases the internship has to be in a "learning" company, which is recognized by the Center of Expertise of the concerned sector. The employer is not obliged to pay any salary to the trainee, but usually a training compensation (equal to minimal wage) is paid. In case of a BBL, the student is usually already an employee with a regular salary.

4.3.3 HR Processes

The Competence Assessment System can be used for HR processes in the company. With the occupations, competences and skills already in the system, the employer could use this information to track his employees.
This could be done within the Competence Assessment System, but this would require services to enter and process the individual employee data. This kind of information requires new criteria to the system: the amount of data will greatly increase, the personal nature of the data requires better security measures, and availability must be acceptable to the employers.
These services do have advantages: with all the employee data in the system, it is possible to create management information about the actual state of the labour market. Another advantage is the revenue that can be generated, making sure the system stays alive, even after the program has ended.

Another way of supporting HR processes with the Competence Assessment System, is to provide information to existing HR systems. The information on occupations, competences and education in the system can be very valuable to HR systems. For instance, it helps linking employees with certain occupations, to training, or defining career paths for employees.

I think that building an entire HR system, in which employer can register and process their employees, is really to much of a challenge. However, providing the gathered information to existing HR systems is a good way of reusing the information, and getting employers and sectors lined up.

4.3.4 Personal development / E-portfolio

In the previous paragraph, the option of using the information in HR processes was discussed. This discussion is also true for individual employees / students / job seekers. Even more so, because individuals probably will not stay in one company for their entire life. When changing employer or study, it would be very helpful to have their experience and education in a "portfolio". This portfolio can be used to find a new job or study.

An e-portfolio system needs standards in order to be used at different sites (employers, schools, intermediates, etc.). The Competence Assessment System can provide these standards, by making the system open and accessible to other (e-portfolio) systems.
One can even consider providing e-portfolio services in CASSY. Services like saving and editing a personal profile, and exporting and importing such a profile. This profile should contain personal data (name and address), experience, education and competences (using the information CASSY has collected).
Like in the previous paragraph, such a system requires extra demands concerning security and availability. On the other hand, it could cause a mindshift in the Bulgarian labour market: with the e-portfolio, the employees get a better understanding of their value for employers. It gives them a better bargaining position, and makes it more clear in which areas they need to grow to become more attractive for employers.

In the Netherlands personal e-portfolio systems are only just emerging. In schools it has become standard to use "Student Files" to track and evaluate

activities of students. These Student Files are now given to the student at graduation, so that it can then be used as personal e-portfolio.
The Dutch Public Employment Service provides a personal e-portfolio system, called Werkm@p (https://www.werk.nl/werk_nl/werknemer/home). The account for this Werkm@p is linked to DigiD (http://www.digid.nl/), a Dutch government service which gives every civilian access to governmental internet services (paying taxes, applying for social security, etc.). Because of this, the system can prefill the portfolio with data that is already available at the so-called "basic administrations" of the government, like name & address, education and working experience.

In order to use the e-portfolio at different sites, schools, employers and intermediates, the e-portfolio must be "transferable". It must be possible to export and import the data in the e-portfolio in different systems. To make this possible, a standard for exchanging e-portfolio data is required.
In the Netherlands the government has chosen to use a Dutch application profile of the IMS standard (http://www.imsglobal.org/ep/). This application profile is maintained by the Dutch Normalisation Institute NEN (http://www.nen.nl/web/Werken/NTA-2035-Eportfolio-NL.htm).

4.3.5 Job matching

The information gathered in CASSY makes it possible to describe job openings in standard competences, skills and activities. It also makes it possible to describe a person's education and experience a these standard competences, skills and activities. These job openings and persons can then be matched, to get a better match than just using a proprietary occupation name and location. All aspects of a person (education, experience, interests, hobbies, goals, etc.) can be translated to competences and skills, and can be taken into consideration when matching.

CASSY could support Matching on competences, by providing the standards, but also by providing a matching service. This would require specific functionality, and again, specific requirements, but it would really help the labour market, and it could generate an income for the system.

In the Netherlands we are trying to get Matching on Competences into place. The main problem at this moment, is the employer, who is not used to describing his job openings in competences and skills. And because of the economical situation, the employer does not perceive hiring the right people for the right job, a problem. I am sure, though, that soon, this will be a problem, because of the aging population. In Bulgaria this could be a success right from the start.

4.3.6 Labour Market Information

The information in the Competence Assessment System is very valuable as Labour Market Information. The standards set provide a way of comparing different occupations, and even different sectors and regions. If the employers are seduced to enter business specific information, such as the number of employees and their occupation, unfulfilled job openings, and expectations, the information is even more valuable, giving insight in the Labour Market.

This information is valuable for government when making policy, but also for schools when forecasting the number of students, and for employers when finding new employees or trainees.

In the Netherlands this kind of information is gathered through the Centers of Excellence and the public employment service. The Centers of Excellence gather the information through their consultants who visit employers. This information is processed and published in written reports (as an example: the year report by the Center of Excellence for construction: http://www.fundeon.nl/sites/default/files/downloadables/Arbeidsmarktrapporten/Fundeon%20rapportage%20arbeidsmarkt-%20en%20onderwijsinformatie%202011.pdf - in Dutch...).

There is also Labour Market information which is gathered by the public employment service, based on the number of unemployed. This information is not related to competences or education, but does give detailed insight in the labour market by region, sector and demography. The data for "non working job seekers" can be found here: http://www.arbeidsmarktcijfers.nl/panorama/ami_werkzoekenden.asp (again in Dutch, unfortunately).
This information is hardly used at the moment - probably because the interface is too complex. If labour market information is to be provided, make sure the interface is easy to understand.

4.4 Integration with other (European) taxonomies

In the previous chapter, I stated that it is best to use a model that is custom made for the Bulgarian situation. Although that is very true for using the system within Bulgaria, it is not the ideal solution if you want to exchange data with other countries. Exchanging data with other countries can be dealt with by using "translations" to link the Bulgarian taxonomy to other taxonomies.
An example of how this can be done can be found in the Occupations & Education registry in the Netherlands (http://www.boc-register.nl/ [login: govert / welkom1]). We decided to make a translation table for the SBC classification (a Dutch classification used for statistical reporting) and the ISCO classification (an international classification, also used by Eures). The actual reason for making these translations was the obligation of reporting in SBC-standards, and the obligation of transferring job opening to the Eures portal (http://ec.europa.eu/eures/main.jsp?lang=en&acro=job&catId=482&parentCategory=482), using ISCO standards.

Making translation tables is not so hard, but any changes in your taxonomy must be reflected in the translation tables as well. Therefore, it does cost you effort in maintenance, which is easily forgotten. Having that in mind, it is best to make translation tables for the main international standards, but do not make too many of them. Translation to ISCO (occupations), EQF (education) and maybe ESCO (occupations, compentences and skills) should be sufficient. However, make sure that it is possible to add another translation table, if a new (international) standard arises.

Besides making translation tables, it is useful to link the Competence Assessment System to other standards through services. If the system contains individual data like cv's or complete portfolio's, a link to the Europass (http://europass.cedefop.europa.eu/) is useful. This can be achieved by generating Europass XML (http://europass.cedefop.europa.eu/europass/home/hornav/Downloads/TechnicalResources/XML.csp). When doing so, you will see that you need a translation of the Bulgarian competences to Europass Competences.
It is also useful to link the Competence Assessment System to broadly accepted networks, such as LinkedIn (https://developer.linkedin.com/apis), or job boards if these provide services to exchange data.

4.5 Development process

Developing web based solutions requires a specific approach. As you don't have control over the user, the solution must be self-explanatory and pleasant to use. This requires a lot from the interface, the usability and the interaction. The system also needs to be flexible to be able to adjust to the changing needs of the user, and the changing possibilities and limitations of the internet.
In this chapter, I will discuss the main aspects of the development process of the system.

4.5.1 Usability

The key success factor of a web based solution is usability: the system has to be easy to use. This means: clear, self-explanatory, accessible and attractive. In order to be sure these requirements are met, an interaction designer should be present right from the start. As soon as the required functionality is explored, the interaction designer should come up with wireframes: sketches of how the solution could look.

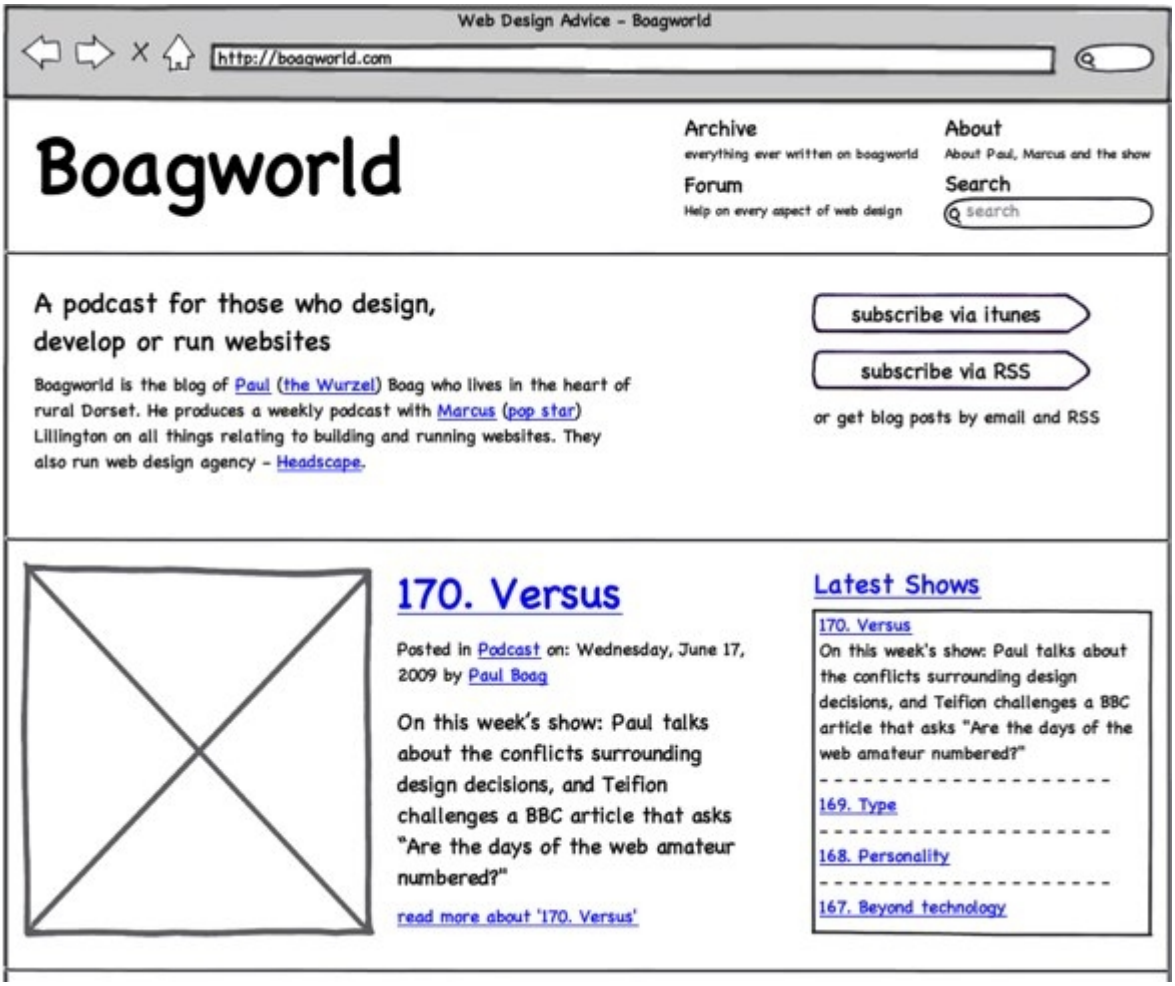

Figure 5.1: example wireframe (from: http://boagworld.com/design/the-7-wonders-of-wireframes/)

These wireframes serve different purposes:

- Making ideas tangible, so that the development team have the same image
- Explaining ideas to others (like management)
- Testing ideas with potential users
- Showing programmers what to make

When we were developing www.werk.nl, we designed new functionality with a team consisting of:

- a business representative, who indicated what business wanted to achieve, and who had authority to decide what to do
- a functional designer, who came up with ideas
- an architect, who was to monitor whether ideas fitted in the architecture
- an interaction designer, who translated ideas into images and screen designs
- a programmer, who was to check whether ideas were technically possible

The ideas were written down in Use Cases, which consisted of the actors involved, the functionality and one or more wireframes. As soon as there were enough Use Cases to encompass a functional entity, a Prototype was built. This

prototype was used to test the design with real users, and (if it passed the test) to help the programmers to make the real system.

One aspect of usability is accessibility. In the Netherlands, all government websites have to comply to the Dutch version of WCAG (Web Content Accessibility Guidelines, http://www.w3.org/TR/WCAG/). Also most commercial websites tend to meet to these guidelines, because they give some guarantee that all users - even impaired - have no problems using the website. Apart from this, complying to the guidelines also increases findability. Therefore, it is good practice to comply to the WCAG.

4.5.2 Iterative / Prototyping

Classical development follows the Waterfall approach: all development steps are performed one after the other:

1. Analysis
2. Functional Design
3. Technical Design
4. Building the system
5. Testing the system
6. Going live
7. Supporting and maintaining the system

This approach works well if the required functionality is relatively simple, and very clear. This functionality is defined in the first two steps, and cannot be changed afterwards.

If this is not the case, then this approach will not work. During steps 3 up to 6, it is very likely that because of new insights, the functionality or the design needs to be adjusted. In this case the iterative approach is more appropriate. In this approach the development steps are repeated several times:

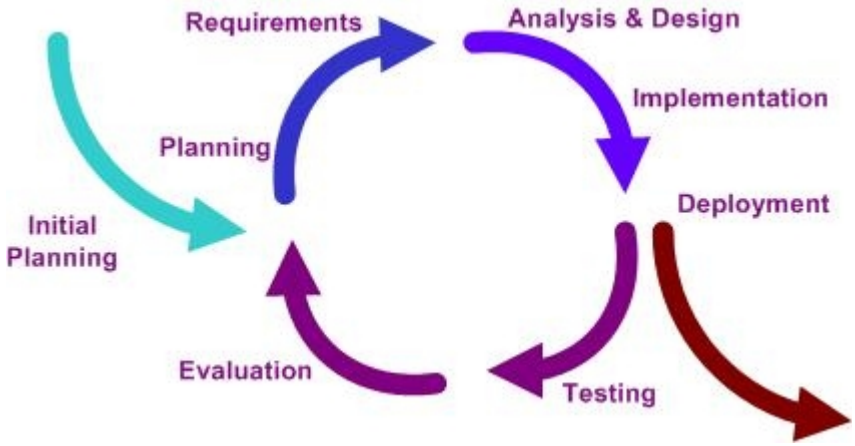

figure 5.2: iterative development (from: http://en.wikipedia.org/wiki/Iterative_and_incremental_development)

For a Web Based Solution such as the Competence Assessment System, I would advise to use the iterative approach. And also, divide the system into components (services) that can be developed more or less separately.
As logical as this may sound, it is not so easy to develop iteratively. If you use a supplier to do the programming, they will want clear defined designs, or they will

not be able to offer a good quote to do the job. Using an iterative approach, you do not have these well defined specifications at the beginning. You need to make clear agreements with the supplier how to deal with this, focusing on time and deliverables, instead of functionality. You can not use functional size analysis, which is often used in classical software engineering (as defined in http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37289).
Another danger is "functional creep": during the iterations many new ideas will emerge, but these are not always related to the goal of the system. Therefore, the team has to be very wary and constantly remind themselves of the goal of the system.
Finally, documentation can be a hazard: during the iterations many choices are made, often not well documented. Then, after a few iterations, the team may no longer remember what choices were made and why these were made.

There are methodologies to prevent the risks of iterative development. In the Netherlands we have good experience with the RUP (Rational Unified Process) methodology. More information on this method can be found here: http://www.rupopmaat.nl/naslagsite2011/index_downloads.html in Dutch, but there is probably information available in English as well.
Other methodologies will probably work as well - it is not so much the content of the methodology, but the fact that you are using it to structure the process.

4.5.3 Service Oriented Development

In chapter 5, I advised to use a service oriented architecture. This kind of architecture does have an influence on the development process.

Functionality will be provided in services, and has to be designed and built in services. The development team will have to decide what set of activities add up to one service. In other words, they have to decide on the granularity of services: too large will make reusing functionality difficult and make the system rigid, too small will make the system complex and will cost performance.
There are no strict rules about choosing the right granularity, it mainly takes experience. But you could argue that every functionality that can be reused, should be a separate service.

Once in place, a Service Oriented Architecture is both flexible and rigid, when it comes to implementing changes. Changing the look & feel is relatively easy: when well implemented the interaction layer is independent from the logical layer. Also rearranging services, maybe to create a new service, is easy as well: with the right tools and processes in place, this can be done on the fly, even by non-technical people. Changing the logics in a service or adding a service, is somewhat more difficult, and making changes in the database layer is really a hassle. That is because the data is used in different services, and changing the data will have effect on all these services.
Therefore, when making changes to a Service Oriented Architecture, be aware on what level you make the change. Different levels require different efforts and therefore different costs.

5 Beyond the program

Once the Competence Assessment System is in place and the program is ended, the system still needs attention. A web based solution is never finished - the world changes and the system has to adapt to these changes. Therefore, you will always need maintenance, support and development.
In this chapter some aspects of the system after the program will be discussed.

5.1 Maintenance and support

Maintaining a system requires a support organisation, consisting roughly of content management, functional support, application support and technical support. There are different models for setting up a good support organisation: ITIL (focusing mainly on technical aspects), ASL (focusing more on applications), BiSL (focusing more on business support), and probably more. What model to choose depends on how the system is positioned: as a nice technical instrument or as a key success factor for the Bulgarian labour market. In the first case, technical support is sufficient and ITIL should work well. In the latter, business processes are important, and BiSL should be chosen.
Still, all models describe support processes, and they all stress the importance of business alignment or strategy. Therefore, the system will need a "business owner" who can tell the support organisation what the priorities are, and who can make decisions when needed.

5.2 Ownership

It is very important to decide who the owner of the system will be after the program ends. This owner will decide what the priorities are, what decisions will be taken and who will be involved in deciding. The owner will probably also have to make sure the funds for supporting and maintaining the system are available.

As the system aims to set a standard in competences and job descriptions, it must be elevated above the involved parties. If the system is owned by employers, employees and educational institutes will probably not trust it. The same goes for the employees and educational institutes.
There are three ways to deal with this:
1- a governmental organisation gains ownership
2- all parties involved become owner through some form of foundation
3- one organisation becomes owner, but incorporates enough transparency and control mechanisms in the system, that all other organisations trust the system

The third option requires a lot from the system, and will probably be too expensive to work.
The second option requires quite some organizing work, and has the risk of one or more organisations to gain control over the others. Therefore I would suggests the first option.

Possibly, BIA could take the place of the organisation elevated above the rest, and gain ownership of the system. Make sure that during the pilot, this is already discussed with the employers and employees that are involved.

5.3 Business Model

Once the program ends, the funds also end... To keep the system alive, new funds need to be found and a business model is needed. To get this business model in place, the added value of the system for every party involved must be calculated. This information can lead to a Business Case, indicating how money is earned (or saved) by whom, and how this will lead to new funds for the system. This does not necessarily mean that services have to be paid - it could for instance mean that the government is going to subsidize the system, because it will cut costs in education or unemployment benefits.

Actually, this Business Case should be made in an early stage of the program, to persuade employers to start using the system in the first place.

6 Conclusions and recommendations

To sum up the main observations and suggestions, I conclude:

- It is a good thing to choose a specific model for the Bulgaria labour market, and use translation tables to link to other (international) models
- Use existing models as inspiration, and learn from them
- Start with a small set of data, use tagging to collect more data during the pilots, and then finalize the taxonomy
- Use assessors, trained by the program, to collect the data during the pilots
- Use a Service Oriented Architecture to ensure flexibility and the possibility to provide all sorts of services
- Develop in iterations, but use some methodology to keep focus
- Pay attention to Usability right from the start
- Find a "killer app" which you know will convince the users to start using the system
- Make a business case to convince employers to use the system and to have a basis to keep the system alive after the program ends
- Decide who will be the owner of the system after the program ends

These conclusions and recommendations are based on the discussions we had in Bulgaria, but even more on my experience in the Netherlands. Therefore, do not blindly accept my recommendations as the absolute truth, but treat them as suggestions or even just inspiration.

I had a really good time in Sofia, met so many great people and learned a lot. The best of luck with the program!