

# AGILE AND MORE: A SUCCESSFUL REDESIGN OF ICT-INFRASTRUCTURE AND INFORMATION EXCHANGE IN HIGHER EDUCATION IN THE NETHERLANDS.

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## Summary

Between 2010 and 2013 the information exchange process between higher educational institutions and DUO, executive agency of the ministry of Education Science and Culture (OCW), has been fully modernised. For this three year project BRON-HO the agile method (scrum) was used. All chain partners were intensely involved. Thanks to this approach all (!) prior set goals have been achieved.

The project in which the ministry of OCW, 55 educational institutes, the Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU)<sup>1</sup>, the Vereniging Hogescholen<sup>2</sup>, Studielink<sup>3</sup>, software suppliers and DUO collaborated closely, led to the successful implementation of new ICT-infrastructure and a new way of data exchange.

The batch exchange was replaced by XML messages and web services. The CRIHO-register at DUO which contained all data generated by higher education institutions, was replaced by a new structure where enrolments and student results from all educational sectors are registered in the register of education participation and the register education results. The enrolment process in higher education is fully digitalised. The information on tuition fees and the amount of funding is supplied directly when the student registers. Hence the administrative burdens for institutions have been significantly reduced.

For an automation project conducted by governmental organisations to be this successful can be accredited to the approach, which was fundamentally different from previous projects. At the end of 2010 all partners met and together they drafted the master plan for this project. Here the deadline of December 2013 was set. Deliberately was chosen not to produce a list of demands. The only thing that mattered was a result in accordance with the law. Immediately the development process began. After every four weeks the results so far would be assessed by all the partners, which included testing. This process was repeated approximately 40 times (40 x 4 weeks). The success of this project is not only the result of the efforts of DUO or the Ministry but also the result of the commitment and effort of all partners involved!

## What is DUO?

DUO (Dienst Uitvoering Onderwijs) is the executive agency of the ministry of Education Science and Culture (OCW), which also executes tasks for several other ministries in the Netherlands. The main commissioner is the ministry of OWC, for which DUO executes a large number of education related laws and regulations.

DUO's core business:

Provide student grants and allowances for school expenses, collect tuition fees and college loans and provide loans and payments to naturalising individuals;

Funding of educational institutes;

Organise state and naturalisation examinations, attend for all logistical issues for the central examinations for secondary education, manage the selection, enrolments and placements of lottery courses in the higher education;

Collect and manage educational data in several registers;

Enrich educational data to turn them into information products;

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<sup>1</sup> Umbrella organisation of universities in the Netherlands

<sup>2</sup> Umbrella organisation of universities of applied sciences in the Netherlands

<sup>3</sup> Central registration portal for higher education in the Netherlands

Acknowledge diplomas, manage the Diploma Register and represent the National Europass Centre in the Netherlands.

## Why the BRON-HO project

BRON-HO is a chain process in which registrations and diplomas of higher education students are recorded in DUO's registers. These registrations and achieved diplomas are the basis for payment of higher educational institutes. This involves a large number of participating partners: ministry of OCW, Studielink, software suppliers and higher educational institutes

### The old situation

Higher educational institutes have provided DUO with their data since 1986. This used to be done with batches. However, processing these batches and adjustments in the data was very exhaustive. All data generated by higher education institutions were registered in the register CRIHO, from enrolment to deregistration. A student who wished to apply to a university needed to provide a large number of documents; diplomas, grading lists, certificates etc. This seemed not very efficient as much of the information was already in DUO's possession (in one of the registers), for all educational institutions provide DUO with all the students' study results. Once a year DUO determined the amount of state funding an educational institute would receive for the following year based on the number of students registered and the released diplomas.

## The BRON-HO project

The three year project BRON-HO in which the ministry of OCW, 55 educational institutes, the Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU)<sup>4</sup>, the Vereniging Hogescholen<sup>5</sup>, Studielink<sup>6</sup>, software suppliers and DUO collaborated closely, led to the successful implementation of a new way of data exchange.

The batch exchange was replaced by XML messages and web services. The CRIHO-register was replaced by a new structure where all enrolments and all student results of all the educational sectors are registered in the general registers of education participation and education results. The enrolment process in higher education was fully digitalised. The information on the amount of state funding is supplied directly when the student registers. Hence the administrative burdens for institutes have been significantly reduced. .

## Governance

Overall management: programme manager OCW

OCW's programme manager was responsible for overall management of the entire system development BRON-HO within the chain. This means that all chain partners were timely informed and managed on what was expected of them. For example the activities that had to be executed, the agreed deadlines and the working agreements. The programme manager took action in case of problems concerning the working agreements and if necessary presented them to the project group. The collaboration was formed as follows:

For the overall management a management platform and a project group was installed. The project group monitored the progress made and decided on the issues which were presented by the work group system development in which the institutions were all represented.

## Approach in relation to the chain

An important element of the scrum method in relation to the chain is an in place work group. The composition of this group is crucial for the success of the project. The work group has to represent all chain partners, in this case educational institutes, software suppliers, the ministry of OCW, DUO and other stakeholders.

During the first couple of meetings the work group drafted the product backlog. After the product backlog was set up the work group would be differently structured. The meetings were split up into a morning and an afternoon session. During the morning sessions the developed software from the previous sprint would be accepted based on a demo. Also would be decided what would be developed in the following sprint and the acceptance criteria that would have to be met. Here all stakeholders would be present. The afternoon session would be split up into two parallel sessions:

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one technical and one functional meeting. In the technical meeting agreements would be made on the technical aspects of the next sprint (based on what was decided on in the morning session). In the functional meeting would be considered what other aspects could be fitted in the following sprint. After a work group meeting the sprint teams of DUO and the software suppliers would start developing the next sprints functionalities that would be accepted based on a demo in the following work group meeting.

By using the above described method it is possible to connect various systems after only a few weeks. It allows one to see how the systems work, whether the right choices were made and whether these choices need adjustments in a very early stage. After every sprint a small functioning piece of software is delivered which leads to a complete functioning system after all sprints have finished.

### Testing with educational institutions

Acceptance of the new services within the chain was realised by performing a number of tests by the chain partners. The programme manager drafted a master test plan in which all test were described. For each test a detailed test plan was defined. The tests were performed in stages of which a number was already performed during the development process. For a test to be considered to have passed all the individual tests from each partner had to perform successfully. In the following paragraphs the various tests are described.

#### Sprint test

After each sprint would be tested to demonstrate whether the new functionality actually works within the chain (in accordance with the defined requirements). The test was divided into two phases. The first phase was focused on the technical effects between DUO and the educational institutes. The institutes had already defined the acceptance criteria (test cases) in advance. These criteria had been completed with test cases specifically designed to test the interface. In the second phase the institutions actually tested all test cases.

#### Chain test

The objective of the chain test was to demonstrate that the new and/or adjusted connection between software suppliers and DUO function according to the technical requirements throughout the entire chain. Based on the list of demands several scenarios were described for not only the technical but also the functional aspects would be tested throughout the entire chain. These scenarios were drafted by DUO and the institutions under the management of the programme manager.

#### Field test

The aim of the field test was to show that all processes throughout the entire chain could actually be performed by all chain partners. The field test was based on scenarios and check lists of the tests performed by all partners. The preparations and the coordination of the field test were mainly conducted by DUO.

### Scrum / sprints

For the development of applications within the infrastructure of BRON-HO the scrum method has been used. The scrum method is a proven development method which is especially suited to develop software in a fast pace where functionalities aren't developed in a detailed way.

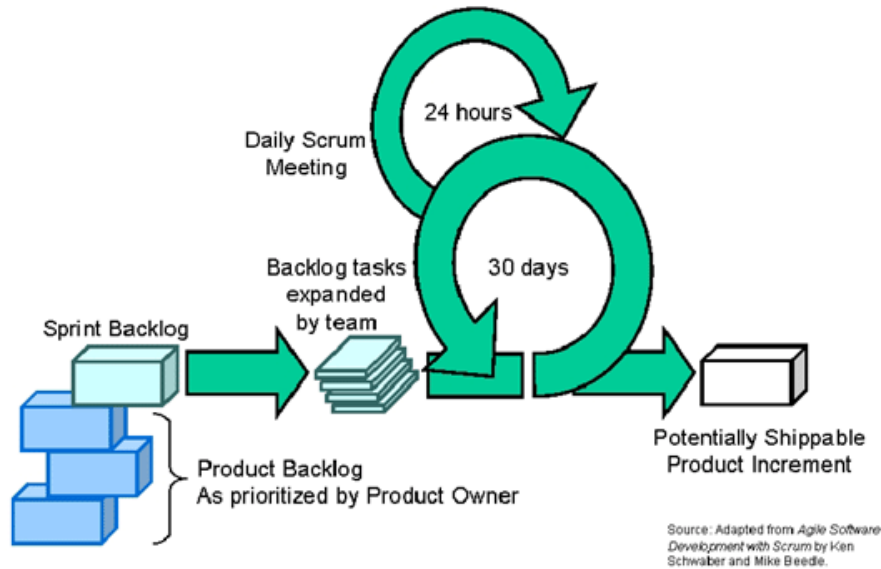


Figure 1: Scrum method

Scrum means working in short iterations, usually of a month. The aim is to deliver completely functional software after each iteration (sprint in terms of scrum). Completely functional means not only coded, but also tested and documented so it could be released right away.

An important element of the scrum method in relation to the chain is an in place work group. The composition of this group is crucial for the success of the project. During the first couple of meetings the work group defines the product backlog. The product backlog is leading for what is to be realised in which sprint. This way the product owner is really in charge of the project. With every new sprint the product owner can decide on the priorities and thus react on market changes.

For a sprint to produce release-ready software doesn't mean each sprint leads to a release. The product owner decides when a release takes place. This could be after each sprint but also after several sprints because only then a complete set of functionalities is available. Even in the latter situation it is important to produce completed software for problems to not be postponed and the productivity to be accurate and realistic.

## Results

The results of the BRON-HO project are the following.

The current way of data exchange based on batches is replaced by exchange based on XML-messages. Now activities such as preparing export files and processing import files are no longer necessary. This leads to less manual activities and less chance of failures. A fully functioning machine to machine connection via Studielink with all educational institutions has been realised within BRON-HO. A service is available which allows institutions to automatically deliver data on registrations and results. This data exchange not only no longer requires manual actions but it is also very robust as educational institutions always send a complete set of information concerning a registration or diploma, which assures information to be complete and correct.

The enrolment process of students by institutions is supported by DUO with the following services:

- Provide personal data (24 x 7)
- Provide previous educational data (24 x 7)
- Provide indication of tuition fee
- Provide altered personal data
- Provide altered previous educational data
- Provide altered indication of tuition fee

The services that supply personal and educational data 24/7 have a response time of only a few seconds. These data are requested from Studielink at the moment a student wants to register his enrolment to an educational institute. The data DUO produces in this process are shown to the registering student. This increases convenience for the student as well as decreases incorrectness.

Within seconds after the student's registration DUO provides an indication for the tuition fee. This enables institutions to easily set up a request for payment (or mandate) for the tuition fee and present this to the student. This significantly shortens the run time of the registration process.

Furthermore DUO signals institutions as soon as personal, educational or tuition data alter. Especially signals concerning altered educational data are very efficient, for the institutions no longer need to request the student for a copy of their diploma and subsequently process these changes.

The scope of the project consisted also of a number of business services. In the former situation the relevant business services were partly individually supplied and executed by several departments within DUO and were supported by the systems CRIHO, HORS<sup>7</sup> and Data Ware House.

In the new situation the business services are to be delivered by DUO in an integral way. Support will take place through various information facility components.

This means that BRON-HO is not really only one new application. It is supplied with data from several generic components. The new structure that replaced the CRIHO register provides data on education participation and education results. Here all facts and figures on participation and achieved results/degrees can be managed for all sectors of education. This new set of applications offers various services to both internal and external partners (such as students, educational institutions and DUO's finance department).

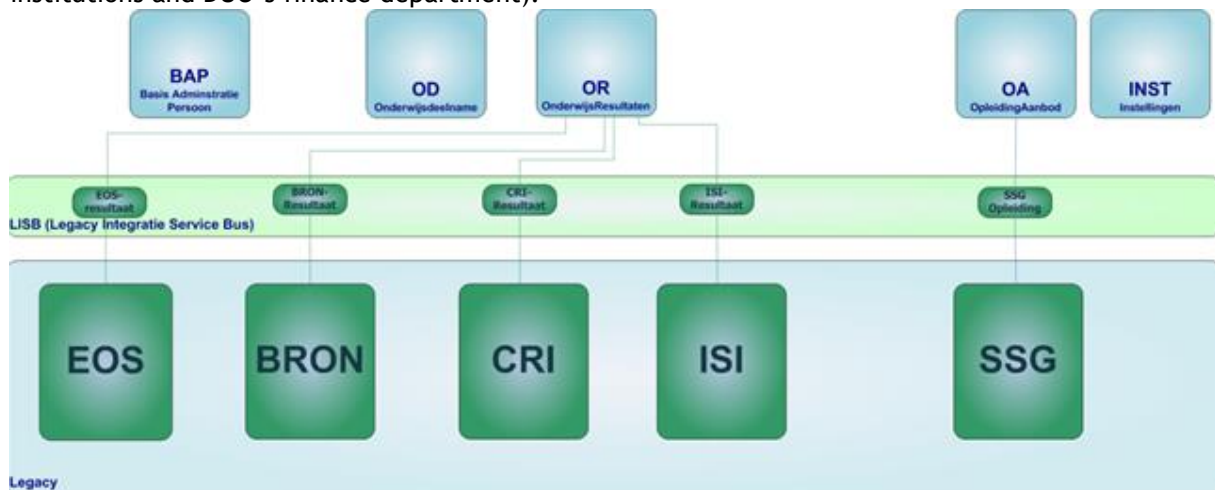


Figure 2: from sector oriented applications to generic registers

The introduction of BRON-HO delivers the following (qualitative) structural benefits:  
 A more flexible infrastructure which enables time to market and implementation costs due to legal changes to be shorter/lower.  
 Create opportunities to provide additional services to external parties in the future, e.g. support the registration process.

The business services are provided by DUO in an integral way. Support will take place through various information facility components. The infrastructure within BRON-HO is created conform an event-driven service oriented architecture. This means that the integration between various business services was released based on events.

The applications HOI<sup>8</sup> and HOST<sup>9</sup> react to events which occur in the registers BAP<sup>10</sup>, OD<sup>11</sup> and OR<sup>12</sup>.

A more flexible infrastructure which enables time to market and implementation costs due to legal changes to be shorter / cheaper. By realising various business services supported by several

<sup>7</sup> Application for the calculation of payments per institution

<sup>8</sup> Hoger Onderwijs Informatiediensten: higher education information services

<sup>9</sup> Hoger Onderwijs Status Toekenning: higher education status acknowledgement

<sup>10</sup> BasisAdministratie Persoon: basic administration personal data

<sup>11</sup> OnderwijsDeelname: education participation

<sup>12</sup> OnderwijsResultaat: education result

applications (*separation of concerns*) and *loosely* coupling them, processing changes within a business service will have less impact compared to the traditional silo application, thus time to market is shorter and costs are lower. The run time of the project was decreased due to the scrum method which led to monthly releases. The scrum method also enables greater interaction with educational institutions. This means larger commitment, better functional synchronisation and optimal prioritising.

Opportunities are created to provide additional services to external parties in the future, e.g. support the registration process. By disconnecting registers from information services it is easier to create new services. The registration process is supported by real time supply of centrally verified and relevant educational and personal data as well as the type of tuition fee relevant for this student.

All objectives were realised within the agreed timeframe and had all partners highly satisfied on the results.

### Success factors

After the release of BRON-HO a project evaluation took place. The most important success factors and lessons learned are described below.

The management and project approach played important roles in the success of the project. Both the commissioner (OCW) and DUO showed courage by providing the project much freedom. It was trust that provided the project with the independence it needed. It was based on short lines of management which requires a certain attitude. Also much effort was put in the right focus and priority of the project.

The commitment of all (external) stakeholders (Studielink, educational institutions and software suppliers) was very high. Among other things this was visible through the frequency of the meetings and the number of persons present. A chain project like BRON-HO definitely needs this and requires a certain flexibility, enthusiasm, persuasion, drive and courage from all the stakeholders. This contributed to a good basis which led to priority for the project and increased acceptance.

By frequently showing results and being transparent, through monthly sprints, the stakeholders' - especially the educational institutions - confidence was built.

A project such as BRON-HO requires the entire chain to be extremely well informed. The contribution of the external implementation manager, who frequently visited all involved educational institutions, was substantial.

Internal communication within DUO is not to be underestimated, especially in relation to the attention and priority the project needed.

This large sized project requested a large sense of collaboration and collectiveness both within the chain and the project. Collaboration, both internal and external, worked excellent and has certainly contributed to the success of the project.

At every point in time during the project the objectives and activities were clear to all project partners. The willingness to help each other to realise the objectives was very high.

The phased delivery of BRON-HO has eventually led to a smooth final release. The phasing helped spread the risks and reduce time pressure. This also accounts for the phased connection of institutions to BRON-HO. To be able to divide the project in such phases a well-oiled multidisciplinary team and priority in the various environments is essential.

A project like BRON-HO requires a certain mentality of the project members. Sometimes so called cowboy behaviour can be necessary, however the timing is important. Wanting to learn from previous experiences, awareness of quality and persistence are essential.

BRON-HO was provided with highly qualitative project support, which is very much justified for a project of this size. The project support had a clear additional value for the project in terms of effectiveness and efficiency.

As BRON-HO had a very large number of project members it would almost be too large to manage properly. The independent attitude and professionalism of the members however contributed to pleasant and uncomplicated collaboration.

The implementation phase is one of the most important parts of the project. Due to the large amount of work and the run time needed it is essential to start this process in time and allocate the right people with the right objectives. Focus on the implementation (control and responsibilities) is necessary until the very end of the project.

When a project has to take into account performance requirements which were instructed by external parties it is crucial that these requirements are imbedded from the very beginning of the project.

When generic building blocks are to be used, the performance requirements of these building blocks are to be defined in an early stage.

For an automation project conducted by governmental organisations to be this successful can be accredited to the used approach which was fundamentally different from other projects. At the end of 2010 all partners met and together drafted the master plan for the project. Here the deadline of December 2013 was set. Deliberately was chosen not to produce a list of demands. The only thing that mattered was a result in accordance with the law. Immediately the development process began. After every four weeks the results so far would be assessed by all the partners which included testing. This process was repeated approximately 40 times (40 x 4 weeks). The success of the project does not only belong to DUO or OCW but to the commitment and effort of all partners!

The implementation of the project was split up. The registration process was implemented first and not until one year later the other processes were released. Both releases took place without any complications.

The higher educational institutes are very positive about the results of BRON-HO. The institutions experience less administrative actions and better and quicker available data. The institutions have been more in control of the enrolment, payment and funding processes since the introduction of BRON-HO.

During the tests the implementation manager would keep record of the process in a dashboard using traffic light symbols. This dashboard was distributed to all institutions and was used in the management platform to discuss and speed up progress. Institutions would keep each other focussed on the progress which led to less delays.

Final remark from the project manager:

The approach which was used is eligible for every kind of chain which wishes to connect to a basic register.

DUO currently works on the project *Doorontwikkelen BRON*<sup>13</sup> in the vocational education field. When this project finishes, BRON will be further developed within the field of secondary education.

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<sup>13</sup> Follow up development of BRON

## Authors' biographies.

Jan Otten works as policy adviser for the International Services Department at DUO (Dienst Uitvoering Onderwijs), the Executive Agency of the Netherlands Ministry of Education, Culture and Science

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- 1987 - 2001 Hanze Hogeschool (University of Applied Sciences), Groningen: Policy adviser at the departments of Staf & Organisation, Finance, Education & Students successively.
- 2001 - now DUO: Policy adviser on Higher Education; Secondary Education; Examinations; and Diplomas successively.
  
- From 2007: Development of DUO's Diploma register (ongoing)
- From 2012: Involved in the development of pilots on digital international enrolment within the framework of the Groningen declaration (ongoing)

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Wiebe Busing (1967) is an independent consultant, working in the field of education and IT. In recent years, he has been working for the ministry of Education, Culture and Science, as program manager BRON HO.

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