



Project acronym	B4B
Project full name	Brains for Building's Energy Systems
Grant No	M00I32004
Project duration	4 year (Starting date May 1, 2021)

## Deliverable

### 12-monthly Progress Report

Mirjam Harmelink, Oana Trifan

Work package	0 (Project management)
Result	
Lead beneficiary	TU Delft
Due Date	28 May 2022
Deliverable Status	Draft
File name	B4B-WP0-REP-Outline 12 montly progress report v1.0.docx
Reviewers	

### 3 PROGRESS WP 3: USER CENTRIC INTERFACES AND FEED-BACK

#### 3.1 Result 5: Methodology & data for user-oriented (user-centred) approach in smart building control

Act. 5.1	Development and testing of a user-oriented determination method for comfort and health (Task 3.1).	Start	End
		1	24
Tasks	3.1.1: Self-reporting data gathering and integration	1	18
	3.1.2: Method for occupant's comfort and health assessment	1	24
Indicators	Availability of the method for monitoring and collecting real-time subjective comfort data		12
	Availability of the method for determining user comfort and health-related aspects		24
Sources of information	D3.01: Method of determining the real-time comfort and health level of buildings.		12>18
	D3.02: Method for determining users comfort and health		24
Involved partners	<b>TNO</b> TUD-IO, FME/VLA, Avans, RVB, Unica, O-Nexus, Strukton		
Progress	<p><b>Task updates [M1-M24] (Office Vitae, TNO, TUD-IO, Avans, Unica, Strukton, DGBC, Binnenklimaat Nederland (formerly called VLA), RVB, O-Nexus)</b></p> <ul style="list-style-type: none"> <li>TNO, TUD-IDE and OfficeVitae set up the monitoring platform at Leeghwaterstraat living lab and further developed the feedback dashboards for indoor climate scoring. The lead person on the dashboard work is Razieh Torkiharchegani (TUD), while the lead person on the sensor evaluation working together with Piet Jacobs (TNO) is Martin Havranek (OfficeVitae).</li> <li>Testing of the climate label in Strukton building in Son. Activities included building monitoring and applying questionnaires to users. Further Strukton, TNO and Unica started a field study to compare direct feedback of Unica QR-code vote app with voting boxes.</li> <li>Progress has been made in the indoor climate label platform data dashboard with smart notification and data filtering. The advances have been shown in consortium and public events. Binnenklimaat Nederland has coordinated monthly sessions with indoor climate experts to get feedback on the dashboard and developed methods.</li> <li>RVB has joined the kick-off meeting and provided market feed-back</li> <li>DGBC and O-nexus gave feedback during kick-off and monthly WP3 progress meetings</li> </ul> <p><b>Events and presentations</b></p> <ul style="list-style-type: none"> <li>Session at the first B4B consortium meeting: Low-threshold feedback on the indoor climate with e.g apps.</li> <li>Presentation by David Keyson (TUD-IO / Office Vitae) in conference Bits, Bricks and Behaviour in Rotterdam (9th November 2021)</li> <li>Presentation label by Piet Jacobs (TNO) at Workplace Experience (29 March 2022). Binnenklimaat Nederland and Office Vitae have hosted an exhibition stand about the label. During two days discussions were held with the market about the label.</li> <li>Presentation by Piet Jacobs (TNO) and David Keyson (TUD-IO / Office Vitae) on Brains4Buildings Webinar (April 20<sup>th</sup>, 2022). Indoor climate label: user centric assessment methods of comfort and health.</li> </ul> <p><b>Publications and other output</b></p> <p>Please add if available?</p> <p><b>Deliverables</b></p>		

Act. 5.1	Development and testing of a user-oriented determination method for comfort and health (Task 3.1).	Start 1	End 24
	<ul style="list-style-type: none"> <li>D 3.01: This is in line with the time schedule from this task, which is from M1 – M18, see page 40 of Bijlage 13B Werkpakket Beschrijvingen. More important this permits us to incorporate tests to be carried out by Strukton and Unica in this field (see mail Piet Jacobs 21/02)</li> </ul>		
Deviations	To the time planning of the activity	No deviations	
	To the team and partners involved in the activity	No deviations	
	To the objective and tasks	No deviations	

Act. 5.2	Developing methods & collecting user data for FDD, continuous monitoring and commissioning (Task 3.2).	Start 1	End 26
Tasks	3.2.1: End-user requirements for fault detection and diagnostic control systems and interfaces	1	12
	3.2.2: Determination of relevant feedback to end-users to support energy efficiency and health	6	24
	3.2.3: Comfort and occupancy data for FDD system	6	26
Indicators	Insight into which feedback helps with user acceptance, reducing complaints and increasing energy savings		20
	Availability of comfort and occupants' behaviour data for fault detection and diagnosis and building control and management.		24
Sources of information	D3.03: Insight into which feedback helps with user acceptance, reduction of complaints and increase energy savings > merge with D3.06		10> 12
	D3.04: Insight into which feedback promotes acceptance by the user, reduces complaints and increases energy savings		20
	D3.05: Comfort and occupants' behaviour data for fault detection and diagnosis and building control and management.		24
Involved partners	<b>TU/e</b> TNO, Avans, APTA Technologies RVB, Spectral, Strukton, DGBC, Unica, O-Nexus, Cloud Energy Optimizer		
Progress	<b>Task 3.2.1 updates</b> [M1-M12] (TUE, TNO, DGBC, Spectral, Strukton, Cloud Energy Optimiser, AptaTech, Simaxx).  For task 3.2.1 <i>End-user requirements for fault detection and diagnostic control systems and interfaces</i> , TNO and TUE carried out the following activities with partners APTA Tech, Spectral, Strukton, DGBC, Unica, O-Nexus and Cloud Energy Optimizer to determine the interfaces requirements from a market perspective: <ul style="list-style-type: none"> <li>Presentations during WP3 monthly meetings.</li> <li>Session during the B4B Consortium meeting in October 2021.</li> <li>Questionnaire survey.</li> </ul> Furthermore, a literature study was carried out by TUE on the shortcomings and opportunities offered by smart buildings and systems for Facilities management, and for building occupants.  TNO carried out a series of follow up interviews with selected partners <b>and FMs</b> .  The results from these activities were used to prepare a workshop in the international conference Clima 2022, which will be used as final input for Deliverable 3.03/3.06 (merged deliverables).  <b>Task 3.2.2 updates</b> [M6-M24] (TNO, TUE, Cloud Energy Optimiser, Spectral, DCBG Strukton, Simaxx)  - Working group with knowledge-based partners have been established (TNO, TUE, HAN, Avans).		

Act. 5.2	Developing methods & collecting user data for FDD, continuous monitoring and commissioning (Task 3.2).	Start	End
		1	26
	<p><b>Task 3.2.3 updates</b> [M6-M26] (TUE, AptTech, Avans, Cloud Energy Optimiser, Strukton, O-Nexus, Unica, Simaxx)</p> <p>A literature review has been carried out on occupancy, occupants' behaviour and comfort data utilised in FDD and building control.</p> <p>Current applications of occupancy data in control systems have been discussed with technology partners (Cloud Energy Optimiser, Strukton, O-Nexus, Unica, Simaxx) during workshops and WP3 meetings. This initial conversations will be the basis to further develop use cases and to establish common research activities.</p> <p>A monitoring plan for the HHS living lab is being prepared with HHS (link WP2), AptTech and Unica. This will be the basis for the Use Case for Unica (also for task 3.3).</p> <p>Furthermore the following activities have been carried out to ensure the connection of Task 3.2.3 with other tasks and WPs:</p> <ul style="list-style-type: none"> <li>Meeting between TNO (representing WP4) and TUE to discuss the link between WP3 and WP4, specifically on the data collection needs.</li> <li>Meetings with TUD and TUE (WP1) to define the format for data collection in Living Labs in relation to occupants data needed for FDD and building control.</li> <li>Avans has started two student projects on ML and user interfaces. The research questions were defined in collaboration with partners Strukton, O-nexus, HAN, and TUE.</li> </ul> <p><b>Events and presentations</b></p> <ul style="list-style-type: none"> <li>Session at the first B4B consortium meeting: Requirements for user interfaces, organised by TUE and TNO.</li> <li>Preparation of workshop at Clima conference 2022 on interfaces for Facility managers.</li> </ul> <p><b>Publications and other output</b></p> <ul style="list-style-type: none"> <li>TUE prepare and recorded a webinar for BREEAM experts, led by DGBC.</li> </ul> <p><b>Deliverables</b></p> <ul style="list-style-type: none"> <li>D3.03 merged with D3.06 into one deliverable because of overlapping of topics and activities.</li> </ul>		
Deviations	To the time planning of the activity	Deliverable 3.2.1 will be postponed to <b>M12</b> due to Covid (staff)-related issues.	
	To the team and partners involved in the activity	No deviations	
	To the objective and tasks	No deviations	

Act. 5.3	Developing methods & collecting data for users to support energy flexibility (Task 3.3).	Start	End
		1	36
Tasks	3.3.1: End-user requirements for energy flexibility control systems and interfaces	1	12
	3.3.2: Determination of the resident behavior changes needed and relevant feedback to end users to improve flexibility management and user acceptability	12	36
	3.3.3: Development of user profiles for hybrid models	1	18
Indicators	Availability of a method for visualizing the operation of building systems, energy use, subjectively experienced health aspects and the impact of behaviour on this		36
	Availability of behavioural profiles to use in the hybrid models in results 1a, 2a and 2b		18
	D3.06: End-user requirements for energy flexibility control systems and interfaces > merge with D3.03		10> <b>1</b> <b>2</b>

Act. 5.3	Developing methods & collecting data for users to support energy flexibility (Task 3.3).	Start 1	End 36
Sources of information	D3.07: Determination of the behavioural changes of the residents that are needed and relevant feedback to end-users to improve flexibility management and user acceptability		36
	D3.08: User profiles for use in hybrid models		18
Involved partners	<b>TNO</b> TU/e, APTA Technologies, Avans, O-Nexus, Unica, DGBC, Cloud Energy Optimiser, HAN, Spectral, Almende		
Progress	<b>Task 3.3.1 updates</b> [M1-M12] (TNO, TUE, DGBC, O-Nexus, Cloud Energy Optimiser, AptaTech, Unica)  (Same updates as in Task 3.2.1, repeated here: )  For task 3.2.1 <i>End-user requirements for fault detection and diagnostic control systems and interfaces</i> , TNO and TUE carried out the following activities with partners APTA Tech, Spectral, Strukton, DGBC, Unica, O-Nexus and Cloud Energy Optimizer to determine the interfaces requirements from a market perspective: <ul style="list-style-type: none"><li>• Presentations during WP3 monthly meetings.</li><li>• Session during the B4B Consortium meeting in October 2021.</li><li>• Questionnaire survey.</li></ul> Furthermore, a literature study was carried out by TUE on the shortcomings and opportunities offered by smart buildings and systems for Facilities management, and for building occupants.  TNO carried out a series of follow up interviews with selected partners and FMs.  The results from these activities were used to prepare a workshop in the international conference Clima 2022, which will be used as final input for Deliverable 3.03/3.06 (merged deliverables).  <b>Task 3.3.2 updates</b> [M12-M36] (TUE, TNO, DGBC, O-Nexus, Cloud-energy optimised, Avans, HAN, Unica, Almende)  Not started yet, but starting planning activities around use cases involving the investigation of interfaces for end-users.  <b>Task 3.3.3 updates</b> [M1-M18] (TNO, TUE, Spectral) <ul style="list-style-type: none"><li>• TNO has carried out a literature study on existing models and made a review of models already used in previous project</li><li>• TNO organised meetings to align goals and objectives with the task leaders of WP1 and WP2 involved with the hybrid models (TUD, TUE, HHS), and to discussed the monitoring plan.</li><li>• TNO has established one of the TNO offices will be the Living lab. TNO uses data from the existing BMS and data from new sensors for developing user behaviour input.</li><li>• The monitoring of living labs Stieltjesweg/Next Delft (i.c.w. WP1 &amp; WP2 Hybrid model development) has started.</li></ul> <b>Events, presentations,</b> <ul style="list-style-type: none"><li>• Session at the first B4B consortium meeting: Requirements for user interfaces, organised by TUE and TNO.</li><li>• Preparation of workshop at Clima conference 2022 on interfaces for Facility managers.</li></ul> <b>Publications and other output</b>  N/a		

Act. 5.3	Developing methods & collecting data for users to support energy flexibility (Task 3.3).	Start	End
		1	36
	<b>Deliverables</b>  D3.06 merged with D3.03 into one deliverable because of overlapping of topics and activities.		
Deviations	To the time planning of the activity	Deliverable 3.06 will be postponed to <b>M12</b> due to staff-related issues.	
	To the team and partners involved in the activity	No deviations	
	To the objective and tasks	No deviations	

Bottlenecks	No bottlenecks.
- Consequences	
- Solutions	
Successes	<ul style="list-style-type: none"> <li>- Good advanced on the Indoor Climate Label Platform, which is near completion. The label has been presented in several national outlets.</li> <li>- Tasks 3.2.1 and 3.3.1 and corresponding (merged) deliverables 3.03 and 3.06 are almost completed. Results will be the basis for an international workshop with (external) industry stakeholders. The results of the workshop will be included in the deliverable.</li> <li>- Industry and academic partners are collaborating in students' projects at Avans.</li> <li>- Partners collaboration within use cases have been further defined. Research and implementation plans are in preparation (upcoming work on occupancy models and interfaces in 3.2, 3.3 and 3.4).</li> <li>- Living labs have been selected and data collection and experiments have started (task 3.1, 3.2 and 3.3).</li> </ul>
- Area <sup>1</sup>	
- Success-factor(s)	
Plans for the next 6 months	Focus on deliverables, continue data collection on living labs and focus on collaboration activities with other WPs.

### 3.2 Result 6: Prototyping data-driven user-oriented interfaces for a healthy indoor climate, energy-efficient and energy flexibility of the building

Act. 6.1	Defining the programme of requirements for the interfaces for the different stakeholders (Task 3.4).	Start	End
		13	48
Tasks	3.4.1: Determination of interface requirements for different groups of stakeholders	13	18
	3.4.2: (Re)design user interfaces	19	36
	3.4.3: Implementing, optimization and validation of user interfaces	24	46
	3.4.4: Determination of user-centric design and evaluation approach	42	48
Indicators	Availability of the program of requirements for the redesign of interfaces of O-Nexus, Unica and Spectral		16

<sup>1</sup> Research, economically, societal, international relations, innovation

Act. 6.1	Defining the programme of requirements for the interfaces for the different stakeholders (Task 3.4).		Start	End
			13	48
	Availability of the (re)design of the interfaces			35
	Evaluation of the interfaces			42
	Availability of a user-centric approach to the design and evaluation of interfaces			48
Sources of information	D3.09: Requirements for re-design of interfaces for O-Nexus, Unica and Spectral			18
	D3.10: Results application of WP3 methods to (re)design of interfaces			35
	D3.11: Validation of WP3 methods on interfaces			46
	D3.12: Evaluation of the user-centred approach to the design and evaluation of the interfaces			48
Involved partners	<u>HAN</u> Spectral, O-Nexus, Unica, OfficeVitae, TNO, TU/e, TUD-IO, Avans			
Progress	This activity has not started yet officially.			
Deviations	To the time planning of the activity		N/a	
	To the team and partners involved in the activity		N/a	
	To the objective and tasks		N/a	

Bottlenecks	N/a
- Consequences	
- Solutions	
Successes	N/a
- Area	
- Success-factor(s)	
Plans for the next 12 months	N/a