SIXTH FRAMEWORK PROGRAMME
PRIORITY 2

Specific Targeted Research Project
ROBOT@CWE
Advanced robotic systems in future collaborative working environments
Contract Number 034002

Deliverable 5.6@M13:
First annual management report

Version	3.0
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Dissemination level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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1. Justification of major cost items and resources

1.1. Work performed

1.1.1 WP1: Screening phase

CNRS
Our participation on this workpackage was mostly on D1.1 for the screening phase, and on the definition of the prototype D1.4. In order to get a clear idea of the technical locks regarding the targeted prototype, we started to work on a demonstrator earlier than planned (see T4.2). This helped us to assert in advance some technical difficulties prior to D1.4. During this period the cost related to the personnel is of 8PM for this workpackage.

UC3M
The role of UC3M has been to screen the available robotic technology that can be used within a working environment where robots collaborate with humans.

- Mario Arbulú (2PM) has studied different robotic platforms considering the applications they have been used in. Pavel Staroverov (1PM) has examined their interaction capabilities and Dmitry Kaynov (2PM) the sensorial system.
- Paolo Pierro (2PM) has analyzed different real industrial scenarios where it is possible to introduce a robot that can collaborate with humans.
- Carlos Perez (0.5PM) studied different eWorking Calls regarding robotics projects where robots could be integrated in collaborative environments.
- Carlos Balaguer (1.5PM) has been in charge of choosing different tasks that can be developed using robots in situations of partnership with humans.

TUM

- Investigation of *teleoperation methodologies:* an overview of selected research topics and research trends in the area of modern telepresence and teleaction has been given (D1.1)

PLUS
Activities conducted for T1.1

- Review D1.4
- Assessment and further investigations on the scenarios developed in D1.4@M6

Activities conducted for T1.2

- A holistic evaluation framework was developed for all four Human-Robot-Interaction factors: Usability, User Experience, Social Acceptance and Societal Impact. A comprehensive interdisciplinary review of appropriate evaluation methods, techniques and experimental settings for the evaluation of HRI in collaborative working environments. Innovative methodological approaches like breaching experiments and delphi studies were investigated and adapted for the project.
- The main activities included:
    - Screening of Usability, User Experience, Social Acceptance and Societal Impact studies in HRI.

- Screening of adaptable methods from HCI, Psychology, and Sociology for evaluating HRI in CWEs.
- Further investigations and internal method tests on:
  - Usability Guidelines for HRI
  - User Testing in HRI
  - Biofeedback analysis for measuring User Experience
  - NARS Questionnaire for measuring anxiety against robots.
  - Delphi method for expert evaluations
- Preparing and conducting an internal workshop for the set-up of the "Factor – Model"
- Set-up a timeline for the method plan for the whole project duration
- Iteration of the method plan according to the reviews from TUM and EPFL

- Activities within this workpackage also included preliminary preparation of the evaluation activities starting at M6.
- The method plan (D1.3@M6.) was delivered.

EPFL

- We conducted a review of the existing CWE interfaces, with a focus on the interfaces used for gesture recognition (for later use in teaching by demonstration). This work was reported in the joint deliverable D.1.1/1.2.

DRAGADOS

The participation in this work package has been focused in obtaining industry scenarios, guidelines and preliminary specifications (T1.3). Thus, the needs in the construction industry involving situations where CWE must be supported are identified (e.g. dangerous situations, site installations work, civil works or building construction) and a scenario for crisis management as a construction context is defined. The work done in this framework makes proposals for potential breakthroughs and presents some prototype definitions. The progress achieved towards the objectives is in line with project schedule although there has been some small delay.

HP-IEC

- HP did the revision of the Deliverable 1.1-1.2.

SAS

- Identified a Planetary Settlement Scenario (PSS) baseline, and accordingly analyzed requirements and constraints for the actual setup of such a scenario. This was reported in D1.4.
- Defined a preliminary taxonomy of tasks for the robots in the frame of the PSS, according to the robot type. Discussed and assessed the suitability of human-robot collaboration modalities in this frame. The overall outcomes are to be used as a baseline for studies and the implementation of CWE architecture in WP2 & WP4. This was reported in D1.4.

1.1.2 WP2: IST-robotic systems integration in CWE

CNRS

We worked on a control architecture called the Stack of Tasks described in more details in Task 2.1 of the activity report. The first evaluation consisted in developing two kinds of controllers using this architecture:

- a controller law to avoid self-collision (task 2.2),
- a controller to handle humanoid-human collaborative work (task 2.2)).

Aside to this control architecture we developed another architecture specific to walking (task 2.1, also related to task 3.5). We also laid the basis for the autonomous visual reconstruction and visual detection of objects (task 2.3).
The cost related to the personnel for this workpackage during the reporting period is 7PM.

UC3M

- Carlos Balaguer (2.1PM), Paolo Pierro (2PM) and Carlos Perez (0.3PM) have designed a specific architecture for the collaborative working environments, where robots and humans work together to get a common goal.
- Paolo Pierro (0.3PM) and Pavel Staroverov (0.5PM) have inspected several collaborative tasks, where the information of the force/torque sensor and the vision system has to be used.
- Mario Arbulú (0.5PM) and Dmitry Kaynov (0.75PM) have investigated the existing technology that can be used by the robot for the exploration of a surrounding environment full of unknown variables, like in the situation of a natural disaster.

TUM

- Literature research was conducted to provide a background for the development of IST-robotic architectures.
- First research on direct human-robot collaboration: an experiment on direct human-humanoid collaboration was conducted.
- A novel approach to reduce the network traffic in haptic telepresence systems with constant (unknown) time delay has been developed.

PLUS

Activities conducted for T2.2

- Included a detailed user and task analysis for HRI in CWEs for:
  - Construction Scenario
  - Rescue Scenario
  - Space Scenario
- First step in the definition and production of D 2.1@M18
  - Screening on adaptable interaction models in HCI
  - Screening on interaction models in HRI
  - Further investigations on direct and indirect interaction tasks and multimodal interfaces
  - Preparation and conduction of an internal workshop on interaction models in HRI
  - Writing on D2.1@M18
- Preparation and conduction of an online survey as a first step of an online delphi with the project partners as experts on HRI guidelines.
  - Main activities included:
    - Screening on delphi expert interviews

        - Development of an unstructured expert questionnaire
        - Pre-test of the unstructured questionnaire
        - Iteration of the online survey
        - Distribution of the online survey

Activities conducted for T2.3:

- Included a detailed investigation on collaborative working environments as context factor for HRI.

Activities conducted for T2.4:

- Screening on telepresence
    - Further investigation on haptic feedback in telepresence
    - Further investigation on visual feedback in telepresence
    - Further investigation on auditory feedback in telepresence
- Included the preparation of a video-prototype based focus group on user experience and social acceptance of teleworking concepts.
    - Main activities included:
        - Preparation of the video-prototype
        - Set-up of the focus group design
        - Internal focus group pre-test
        - Developing moderation guidelines for the focus group

DRAGADOS
The role of Dragados in this work package is related to T2.3 in the area of IST-robotic systems interacting in a dynamically changing construction environment. Therefore, the contribution is from a construction company point of view. Construction sites are unstructured sites where several potentially dangerous tasks can be executed concurrently in an asynchronous way making the interaction with IST-systems extremely difficult. Nevertheless, different construction works offer different scenarios for collaboration with differing constraints for collaborative work. Dragados is preparing a set of different construction work examples for this collaborative work.

SAS

- Elaborated on the PSS and associated analysis of human-robot working schemes, and detailed collaboration modalities aiming at further CWE teleworking concepts and architecture implementation (i.e. WP4). Ongoing work, to be reported in D2.4.
- Reviewed and assessed applicability of identified concepts for human robot interaction, in the frame of the PSS for teleworking (i.e. teleoperation and telepresence). Study of the suitability of particular schemes such as “ecological display” approach. Ongoing work on identifying and assessing relevant technologies for this purpose in the particular PSS context.

1.1.3 WP3: IST-robotic – CWE interfaces and evaluation of impacts

CNRS
During this period we worked on some haptic interfaces to integrate robotics systems in CWE. Moreover we also investigated software architecture for robots’ perception-action loop based on vision. More specifically we investigated self-localization, reactive motion

generation based on vision, and the architecture to implement various walking pattern generator algorithms. The personnel cost related to this workpackage is 3 M/M

UC3M
Humans will communicate with the robot using an interface technology such as a PDA system.

- Carlos Balaguer (0.5 pm) and Paolo Pierro (1 pm) have designed the requirements for its use in collaborative environments.
- Pavel Staroverov (0.3 pm) and Dmitry Kaynov (1 pm) have been in charge of defining the protocol for the wireless communication.

PLUS
Activities conducted for T3.3:

- included the preparations and conduction of an on-site breaching experiment in cooperation with TUM.
- The main activities included:
    - Screening of sociological concepts for behaviour on public spaces (as theoretical basis for the field trial)
    - Screening of breaching experiments in HCI and HRI (as methodological basis for the field trial)
    - Screening of robotic acceptance methods (as methodological basis for the field trial)
    - Developing and iterating the experimental set-up with TUM
    - Developing and pre-testing two semi-standardized questionnaires on social acceptance and societal impact for the experiment
    - Analysing the questionnaire data with SPSS
    - Analysing and interpreting the observational material
    - Paper and video submission of the field trial for HRI2008
    - Paper submission of the field trail for CHI2008
    - First activities on improving the experimental set-up for further studies with other project partners

Activities conducted for T3.4:

- As the above described field trail addresses social acceptance as well as societal impact, the activities described for T3.3 are half-assigned to T3.4

HP-IEC
HP is task leader for task 3.5
Work done:

- Collected information about HP products (iPAQ, tablet) and non-HP products (i.e. Microsoft Robotic SDK) that can be used for supporting Robot@CWE.
- Research on development environments for handled devices.
- Support to other partners on handheld devices for interfacing with robots.
- Preparation of a presentation for the meeting in Munich about requirements for software support, architecture methodology, device alternatives and development environments for the proposed devices.
- Team building and initial coordination for deliverable D3.3

- Requirement collection for support software for Robot@CWE, through questionnaire (slides) and conference call

1.1.4 WP4: Prototypes and evaluation

CNRS
We started to work on the prototypes of control architecture and novel control laws to safely deal with the uncertainty of human-IST robot collaboration. After several experiences this led to a telepresence experiment including a human-humanoid interaction (task 4.1, 4.2 and 4.3). This allowed us in to evaluate the concepts developed in the workpackage 2 (Task 2.1 and 2.2.) The overall cost in personnel induced by this work is 10 MM.

TUM

- The robot platform *Autonomous City Explorer (ACE)* has been used in a field experiment on robot acceptance

EPFL conducted work as part of task 4.1 **“**Proof-of-concepts prototypes” and task 4.3 “Collaborative human/humanoid scenarios”.
We focus on tasks involving bimanual coordination between the user and robot. During the first year, we focused on transferring bimanual skills from a human to a robot. In order to extend this to understand human-robot collaboration during bimanual tasks, it is necessary for the robot to predict and interpret the human’s motion. Therefore we investigated the main aspects of bimanual coordination that would guarantee satisfactory robot's performance in simple manipulation tasks. These characteristics of the movements are learned automatically as part of a robot programming by demonstration framework. We investigated two types of coordination constraints: spatial constraints (e.g. two arms must adopt a specific spatial relation to one another) and temporal constraints (two arms must synchronize and should reach a target position at the same time).

1.1.5 WP5: Management of the project

CNRS
During this period CNRS we realized the deliverables related to the project meetings (D5.1, D5.2, D5.3, D5.4, D5.5 and D5.6), the setup of the web server and web site of ROBOT@CWE (task 5.3). The personnel cost for the reporting period is 12PM.

UC3M

- Carlos Balaguer (0.1PM), Paolo Pierro (0.1PM) and Carlos Perez (0.1PM) have worked together in order to prepare the meetings and collaborating with other partners.

TUM

- Organisation of the 3rd project meeting: logistics, information of consortium
- Preparation of contribution to 1st Periodic Progress Report
- Internal management

PLUS
Activities conducted for T5.2:

- Contribution to the annual progress report No1 covering periods M1-M12 (D5.6@M13)
- Contribution to the preparation of consortium meetings
- National and scientific dissemination activities (e.g. communication with press)

DRADADOS
The management activities of Dragados in the period are those related to the internal management of the project and coordination with other partners.

1.2. Explanatory note on major cost items

CNRS
No major cost item only travelling costs that are higher due to the distance separating Japan and Europe. However, this has been agreed on with the PO and the formal unit.

UC3M
This first year was characterized especially by a theoretical study: the entire budget consumed by UC3M was used for travelling.

TUM
No major cost items

PLUS

Cost Item Description	Cost (EURO)	Justification
Travel costs	2073,23	- Attending different Consortium meetings in Lausanne, Paris, Munich, - Field Experiment with TUM in Munich - Visiting different partner Labs: CNRS LAAS, TUM, EPFL
Other costs	910,46	job advertisement in a newspaper

EPFL
No major costs.

DRAGADOS
No major cost items.

HP-EIC
HP did not report any major cost item other than personnel costs.

SAS
No major cost items

1.3. Budgeted costs vs. actual costs

ALL.

→ Fill the related excel file

1.4. Budgeted person-months vs. actual person-months

ALL.

→ Fill the related excel file

1.5. Impact of major deviations from budgets

CNRS
No major deviations

UC3M
No major deviations

TUM
No major deviations

PLUS
No major deviations

EPFL
No major deviations

DRAGADOS
No major deviations.

HP-EIC
No major deviations

SAS:

Task	Planned effort for Y1	Spent effort	Deviation	Summary explanation
T1.2 T1.3	2 2	1 3	- 1 +1	1 PM transferred from T1.2 to T1.3, as an adjustment to the actual respective work load of the tasks. (see section 3.1.2 and 3.1.3).
T2.2	2,4	1,4	-1	- Started later than

				expected. - Inputs from / interaction with partners expected. - Will be compensated in the M12-M18 time frame. (see section 3.2.2)
T2.4	1,2	0,8	-0,4	- Started later than expected. - Inputs from / interaction with partners expected. - Will be compensated in the M12-M18 time frame. (see section 3.2.4)

Total PM deviation: Planned effort = 8,3 PM
Spent effort = 6,9 PM
Deviation = -1,4 PM

2. Form C

See original signed forms attached with the sent document

3. Summary financial report

ROBOT@CWE : Cost Budget Follow-up Table

Contract N° 034002 ROBOT@CWE

PARTICIPANTS	TYPE of EXPENDITURE (as defined by participants)	Budget (Eligible Cost)	ACTUAL COSTS (EUR)				Pct. Spent	Remainning Budget (EUR)	
			RTD	Demonstration	Management	Total	Total		Total
		Whole duration	M1-M12	M1-M12	M1-M12	Period 1	% Period 1		EC contribution period 1
CNRS									
FCF	Personnel costs	479 592,00	166 574,08		32 734,53	199 308,61	41,56%	280 283,39	
	Equipment	0,00	0,00			0,00		0,00	
	Travel	69 000,00	9 893,06			9 893,06	14,34%	59 106,94	
	Consumable	10 000,00	4 043,40			4 043,40	40,43%	5 956,60	
	Overheads	91 872,00	36 102,11			36 102,11	39,30%	55 769,89	
	Total Costs	650 464,00	216 612,65	0,00	32 734,53	249 347,18	38,33%	401 116,82	141 040,86
UC3M									
FC	Personnel costs		52 501,90			52 501,90			
	Equipment		0,00			0,00			
	Travel		2 648,63			2 648,63			
	Consumable		0,00			0,00			
	Other specific costs		1 000,00			1 000,00			
	Overheads		42 841,55			42 841,55			
	Total Costs	387 182,00	98 992,08	0,00	0,00	98 992,08	25,57%	288 189,92	49 496,04
TUM									
AC	Personnel costs	114 800,00	14 127,07			14 127,07	12,31%	100 672,93	
	Equipment	0,00	0,00			0,00		0,00	
	Travel	9 000,00	2 276,69			2 276,69	25,30%	6 723,31	
	Consumable	58 443,00	6 617,35			6 617,35	11,32%	51 825,65	
	Overheads	36 449,00	4 604,22			4 604,22	12,63%	31 844,78	
	Total Costs	218 692,00	27 625,33	0,00	0,00	27 625,33	12,63%	191 066,67	27 625,33
PLUS									
AC	Direct costs	178 333,33	60 005,98			60 005,98	33,65%	118 327,35	
	Personnel costs		57 022,29			57 022,29			
	Equipment		0,00			0,00			
	Travel		2 073,23			2 073,23			
	Consumable		910,46			910,46			
	Overheads	35 666,67	12 001,20			12 001,20	33,65%		
	Total Costs	214 000,00	72 007,18	0,00	0,00	72 007,18	33,65%	141 992,82	72 007,18
EPFL									
AC	Personnel costs	181946,25	52 994,40			52 994,40	29,13%	128951,85	
	Equipment		0,00			0,00			
	Travel		1 525,40			1 525,40			
	Consumable		0,00			0,00			
	Overheads	36 389,25	8 637,30			8 637,30	23,74%	27 751,95	
	Total Costs	218 335,50	63 157,10	0,00	0,00	63 157,10	29,00%	155 178,40	63157,10
Dragados									
FC	Personnel costs	226 899,00	50 809,00		2 994,00	53 803,00	23,71%	173 096,00	
	Equipment								
	Travel								
	Consumable								
	Overheads	107 168,00	34 859,00		2 054,00	36 913,00	34,44%	70 255,00	
	Total Costs	334 067,00	85 668,00		5 048,00	90 716,00	27,16%	243 351,00	47 882
HP-EIC									
FC	Personnel costs	137 600,00	27 818,53			27 818,53	20,22%	109 781,47	
	Equipment								
	Travel								
	Consumable								
	Overheads	182 400,00	29 256,00			29 256,00	16,04%	153 144,00	
	Total Costs	320 000,00	57 074,53			57 074,53	17,84%	262 925,47	28 537,27
SpaceApps									
FC	Personnel costs	211 920,00	65 869,94			65 869,94	31,08%	146 050,06	
	Equipment	6 000,00	0,00			0,00	0,00%	6 000,00	
	Travel	10 000,00	1 207,84			1 207,84	12,08%	8 792,16	
	Consumable	0,00							
	Overheads	179 080,00	35 042,90			35 042,90	19,57%	144 037,10	
	Total Costs	407 000,00	102 120,68	0,00	0,00	102 120,68	25,09%	304 879,32	51 060,34
TOTALS		2 749 740,50	723 257,55	0,00	37 782,53	761 040,08	27,68%	1 988 700,42	339 765,26