CLARK –
replacing GIRAFF by MetraLabs

Selection of CLARK

During the panel meeting on 13.07.2015 the three independent experts have suggested three proposals to address the PDTI challenge on Comprehensive Geriatric Assessment for funding during Phase I (see panel report dated 7th August 2015: CLARK, ARNICA and ASSESSTRONIC. GIRAFF TECHNOLOGIES AB [PIC 972486208] is one of the partners involved in the CLARK proposal. The role assigned to GIRAFF was to provide the platform (basis of the technology development) and to commercialize the product after the successful conclusion of Phase III of PDTI.

GIRAFF declared bankruptcy

TUM as the coordinator of ECHORD++ (E++ for short) generated the GPFs and Form Bs of all potential new partners to prepare the Amendment. After several reminders, TUM received a phone call from Stephen Von Rump (CEO of GIRAFF TECHNOLOGIES AB) on 1st December 2015 which informed the E++ coordinator of the fact that GIRAFF declared bankruptcy.

Possible solutions

The following three options were discussed with the CLARK coordinator, SERVICIO ANDALUZ DE SALUD (PIC 998853621).

1. Keep the CLARK proposal in and also keep working with the GIRAFF platform, reassign the task to adjust the platform during the project to the University of Malaga (PIC 999898311) which is another partner of the CLARK consortium. Due to prior cooperation in various projects, the University of Malaga owns several GIRAFF platforms and knows the platform both hardware- and software-wise. Maintenance and the supply of spare parts is uncertain in the future, though, and the consortium would need a new partner to commercialize the platform (latest after Phase I, if selected for continuation)
2. Analyze the contributions of GIRAFF in detail and find an adequate replacement.
3. Go for the next strongest proposal after CLARK.

All aspects taken into account, option 2 seems to be the best approach because it is closest to the original selection and decision taken by the independent experts who evaluated the proposals.

Replacement of GIRAFF within CLARK (option 2)

In order to find an adequate replacement for GIRAFF in the CLARK consortium. In total 7 different potential solutions were assessed against GIRAFF. The comparative assessment was based on the functionalities provided by the different platforms (compared to GIRAFF) as well as the sales force and potential market penetration offered by the different platform provider after Phase III. The results are summarized in the table below. 998853621.

Criterium	GIRAFF (original proposal)	Metralabs GmbH (SCITOS G5)	RobCab (RCab300)	Robotnik (RB-1 base)	PAL ROBOTICS (TIAGO, in a competitive proposal)	Mobile Industrial Solution (MiR100)	IPA Fraunhofer (Mobina)	Neobotix GmbH (MP-400)
Market perspective (commercialization)								
Service: Supply of spare parts / Maintenance	No	Yes	Yes	Yes	Yes (on-demand)	Yes	Yes	Yes (24 months for supply/mainten.)
Founded in	Vasteras, Sweden	Ilmenau, Germany	Vasteras, Sweden	Valencia, Spain	Barcelona, Spain	Odense, Denmark	Stuttgart, Germany	Germany
Validated / PIC?	Did have but no longer	Yes 999673077	No (to best of our knowledge)	To be verified	To be verified	To be verified	Yes	No
Relevant Customers in the healthcare / hospital sector	Danderyd Hospital in Stockholm	Klinikgruppe Enzensberg, e m&i-Rehabilitation Clinic Bad Liebenstein, SIBIS Institute for Social Research Berlin, health insurance fund Barmer GEK Wuppertal, Germany	Mälarsjukhuset Hospital in Eskilstuna, Sweden	Nueva Fe Hospital in Valencia, Spain Hospital Stella Maris in Pisa, Italy (AGSV platforms)	SACRO project	Deployed at ElosMedtTech, Sondenborg Hospital, IKast Brande in Denmark, and soon in 2 more hospitals (delivery apps)	They work together with different end user representatives (elderly care homes and hospitals) in other research projects. Our typical customers (who are buying our R&D services) are medical device or robot manufacturers.	DTI Denmark, Scuola Superiore Sant'Anna
Relevant expertise (please describe, which expertise they have which is relevant for the project):	- Large experience on real **human-robot interaction**use cases (TERESA, ExCITE or GiraffPlus projects)	- Experience on **providing robotic platforms for real healthcare scenarios, focusing on HRI** applications (ROREAS, ALIAS, ROBOT-ERA, HOBBIT, CompanionAble projects)	- Experience on **deployment on a real healthcare scenario**	- **Design and development of robotic platforms**(e.g. the fully customizable RB-1) - Experience on providing robotic platforms for using on real use cases (ROBO-SPECT, RUBICON, RADIO projects)	- PAL Robotics can provide a great expertise in **humanoid platforms**, designed to interact with people in real environment: trade fair, exhibition, hotels, museums and hospitals. They can also provide their expertise on social HRI (e.g. socSMCs FET project) and European projects (Factory in a Day FP7)	- Experience on deployment on real scenarios (healthcare systems)	- **Design and development of robotic platforms** - Experience on providing robotic platforms for using on real use cases (WiMi-Care, EFFIROB, Elevon, SeRoDi projects)	- **Design and development of robotic platforms** - We built the hardware for Care-O-bot 3.
Sales channels:	Direct sales	Direct sales	Direct sales	Direct sales	Direct sales	Direct sales EU distributors	Research institute: therefore they sell R&D services, not mass products.	Direct sales from Germany
Price:	9.500 EUR	Ca. 30.000 EUR	--	Aprox 15.000 EUR	TIAGO IRON – 29.750 EUR	Aprox 22.200 EUR (w VAT)	Aprox 10.000 EUR	20.900 EUR

Technical features relevant for the application:								
Payload	Up to 5 Kg	Up to 50 Kg	Very large (e.g. it is able to move beds)	RB-1 base: 50 Kg	Up to 30 Kg	Up to 100 Kg.	Up to 10 Kg in the new MobiNa	100 Kg
Included sensors:	Microphones / Camera	Navigation skills: - 24 ultrasonic range finders - Closed bumper	Navigation skills: - Front laser - Touch-sensitive sensors	Navigation skills: - Hokuyo Laser - Gyroscope HRI skills: - ASUS Xtion PRO	Navigation skills: - Front laser 4m - IMU (6 DOFs) HRI skills: - Pan-tilt head - Stereo microphones - RGBD camera - Speakers	Navigation skills: - Collision-prevention sensors (ultrasound, scanners and 3D camera)	Navigation skills: - 3D sensor or low cots laser scanner	1 x Sick S300 Expert
Optional sensors:	No	- Laser range finders - Cameras - Metralabs robotic head - Touch screen	No	They propose to build a robot according to the requirements of the CLARC project	- Force/torque sensor - Laser 10m upgrade - Rear sonars - Additional RGBD camera in the base - Additional speaker	No	They propose to build a robot according to the requirements of the CLARC project	6 x US Sensores
Availability to include new third-party sensors	Not easy	Yes 2 RS232, 2 Firewire, 5 USB ports, CANBus…	Not easy	Yes. See above	Yes Expansion ports with: 12/5V with 5A, 36V with 10A, 10GPIO (5in, 5out), 2xUSB3, 4x USB2, 2 Gbit ethernet, …	Yes	Yes. See above	Yes Microsoft Kinect, SwissRanger, microphone…
Mobility (which systems do they use)?	Autonomous mobile platform (Differential drive)	- CogniDrive - Autonomous mobile platform (Differential drive)	Autonomous mobile platform (Differential drive)	Autonomous mobile platform (Differential drive).	Autonomous mobile platform (Differential drive)	Very robust autonomous mobile platform	Currently built over an iRobot Create platform, the new MobiNa will include a new base	Differential driven platform
Interface with the patient	Monitor and microphone/speakers	SCITOS G5 is a base over which many modules (provided by Metralabs) can be mounted: for the HRI necessities of CLARC project, a robotic head, cameras and a touch panel would be included	Must be added	RB-1 base can be customized and also extended(RB-1 humanoid robot mounts a robotic head including RGBD camera and microphones)	A mobile head with a RGBD camera and four microphones for data acquisition, Multilanguage text-to-speech & speech recognition 1 or 2 speakers	Must be added	RGBD camera and microphones, and a touch screen	Optional: Touchscreen, audio output
Data Management (note: remember we	Pilot application for connecting Giraff over the Internet	MIRA middleware, which incorporates built-in security mechanisms to	Navigation information. Not person-related info acquired in	Open source (ROS)	Possibility to stream data over WiFi connection	Navigation information available in tablet or smartphones. Not	Open source (ROS)	RAW Data

don't want data in proprietary format, and some robots might not realise raw data...)	Sentry database (used by care organizations to manage and configure Giraffs and visitors)	protect the data from external threats. Sensor raw data storage is natively supported, and it guarantees no missed frames in streams	standard RCab300 platform		Possibility to integrate software for database management Open source (ROS)	person-related info acquired in standard MiR100 platform		
Overall assessment of the system:								
The particular strength points of this system for the application:	-Flexible development platform (API and plug-in support for third-party applications) - Project support (including branch support for modified source code) - Experience: Giraff is a commercial service, supporting real people in their homes along with their caregivers (Sentry system) - Previous work with the UMA team for platform customization	The installed CogniDrive software provides robust navigation skills: - Autonomous navigation - Detects and avoids obstacles - Moves safely among people - Autonomous recharging Robust system (the base includes a five years warranty, complains with European CE-guidelines and has been certified by the German Technical Inspection Agency) Experience on deployment on a real scenario The SCITOS G5 design allows building a full customized platform for the CLARC project More than 12 operating hours in normal usage. 8 hours when using multiple optional peripherals	Navigation/charging skills are solved: - Gets from department to department on its own - Detects and avoids obstacles - Moves safely among people - Utilizes breaks to recharge batteries Experience on deployment on a real scenario High-level tools for robot management within healthcare centers (HoLoS)	- High-precision odometry measurement in both platforms - Open source code (connection to ROS) in both platforms - The RB-1 design allows building a full customized platform for the CLARC project - More than 10 operating hours	- A robust design for dealing with HRI scenarios - 100% ROS based - Powerful onboard computer (up to i7 and 16GB RAM) - A hand gripper can be added - Documented API and support for customer developments - Simulation model included - Platform flexibility for adding sensor	- Can be equipped with a variety of customized modules - Navigation using its own map. It avoids dynamic obstacles and modifies its path quickly, if necessary -Operating time of 12-15 hours - Lots of retailers across Europe (truly commercial platform)	- IPA Fraunhofer is working on a new MobiNa platform, and they propose to customize it for the CLARC project - 100% ROS based - Navigation skills are solved - Multi-modal user input available at hw & sw levels - Large experience on new design within similar application areas	- Robust industrial use robot platform.

		(that will most probably be also used for the CLARC platform) Lots of retailers across Europe (truly commercial platform)						
The weak points of the system with regard to the intended application:		Expensive Many additional modules have to be incorporated to meet the requirements of the CLARC project. While Metralab provides all these modules (and third-party modules can be easily added) they increase the cost and decrease the autonomy of the customized platform	It is a closed platform that it has not been designed to interact with the patients but to move goods within the healthcare center	RB-1 base should be extended for solving the HRI scenarios of the CLARC proposal	Expensive It is a closed design: but could be modify within the CLARC project Operating time of only 4-5 hours (with 2 batteries) Research oriented	The MiR platform is mainly designed for transporting goods. It has a large payload but it is also very expensive and needs to be customized to support HRI skills.	Low sales force Research oriented	- High priced (MP-400 with battery quick change system and ultrasonic sensors = 24.300 EUR)
Please motivate your preferred option (also in comparison to the GIRAFF platform originally included in the proposal)	Several companies have suggested to modify their prototypes to fulfill the requirements of the project and to adjust costs to the one stated on the proposal (11.850 EUR for the prototype, 24.000 EUR for market price). It should be noted that we can only provide here the prices they have provided us. It is for example clear that the cost of all base platforms can be reduced if the required payload is reduced (some of them are able to move more than 50 Kg). With respect to the effort to modify the platforms within the CLARC project, the hardware aspects could be best provided by the proposals by Metralabs or PAL Robotics. Metralabs has more potential market impact thus SCITOS G5 would become a better choice than TIAGO. If the price of these platforms is considered too high, the MiR100 or the RB-1 are also very interesting alternatives. As the original GIRAFF proposal, all proposals need to be modified at software level. According to all factors the CLARK consortiu suggests the option provided by **Metralabs**. There are several issues to consider ✓ Robust base and navigation skills – The SCITOS G5 is comparable to the MiR100, RB-1 or TIAGO bases ✓ Flexibility – Metralabs provide a complete, modular platform that can be customized to our specific requirements. The RB-1 humanoid robot from Robotnik is more expensive. The TIAGO IRON from PAL ROBOTICS could be difficult to modify to fulfill the requirements of the CGA scenarios. It is of course also possible to add a static 'torso' over the MiR100, the RB-1 or the MP-400 bases, but this work should be addressed within the CLARC project. ✓ Feasibility analysis – Designed to deal with HRI scenarios, Metralabs provide all low-level, fundamental functionality to enable fast prototyping and testing of scenarios. This aspect could be also provided by the improved MobiNa platform, the prototype from Robotnik or the TIAGO IRON from PAL Robotics. Other companies are mainly focus on the base platform and the navigation skill. ✓ Sales channels – Although we do not have explicit data about this point, it appears that Metralabs beats the ones provided by the competitors. At this level, the worst scores should be probably given to the IPA Fraunhofer, more restricted to a Research scenario. The major disadvantage of Metralabs is the price (Ca. 30.000 EUR) of the complete SCITOS G5 platform. They have suggested us to discuss this issue in detail (as the rest of providers!) because they understand that the price could be reduced (e.g. our payload is very reduced as the platform does not need to help the person to walk)							

The results of this comparative analysis suggest MetraLabs as the best option to replace GIRAFF. The platform offers all the functionalities required, MetraLabs has a long and strong market record (in comparison to other options like research institutes), for the commercialization they offer existing contacts to the right market segments / customer groups. The platform, though, is slightly more expensive than the original one suggested by GIRAFF: Initially at 30.000 €, it was possible, though, to negotiate and to get a price guarantee of 15.000 € as a maximum for the platform. MetraLabs will strive to reduce the price even further, but cannot guarantee this.

In order to strengthen the case and substantiate the replacement, feedback from several relevant stakeholder groups is collected (see below):

1) Follow-Up: Seek feedback from the independent experts

In order to verify the portfolio of MetraLabs to replace GIRAFF, the E++ coordinator (TUM) contacted the independent **robotics experts** involved in the original evaluation and in the panel meeting, Andreas Müller (http://www.robotik.jku.at/joomla16/) and Philippe Bidaud (http://www.isir.upmc.fr/?op=view_profil&id=6). Their feedback on replacing GIRAFF by MetraLabs is positive:

Feedback of Philippe Bidaud by mail dated 14.12.2015:

“For me the Metralab solution for the remplacement is fine. MetraLabs sells the Scitos A5 primarily as a mobile service robot for point-of-sale and exhibition booth application but which can be potentially "converted" to the implementation of the experimental scenarios considered in the PDTI project. The robotics Platform comes with a robust 2D navigation software (see data sheet http://www.robotshop.com/media/files/pdf/datasheet-scitos-g5-advanced-hmi.pdf). The Scitos A5 is bout 1.5 meters tall and weighs about 75 kg, it is not portable but none of the others (from the 2 others consotia) are portable !) . Moreover the company is involved in others markets and it seems quite "robust". I support this solution !”

Feedback of Andreas Müller by mail dated 14.12.2015:

“from what I know about the Metralab platform, and what Philippe said, I'd think this could be a feasible solution. The price difference is something that will have to be considered. But as you said this is a common challenge of all consortia. So I would agree to this solution.“

Both mails are attached to this document.

Asked if this higher price would have changed the results of the selection / decision of the independent experts at the panel meeting, the statement is that this would have had no impact (see mail attached to this document).

2) Follow-Up: Confirmation of the coordinator of the CLARK consortium concerning the replacement of GIRAFF by MetraLabs

With the confirmation herewith attached, the coordinator of the CLARK experiment confirms that MetraLabs is an adequate replacement for GIRAFF both in terms of technology (platform) and in terms of commercialization.

3) Follow-Up: Confirmation of the E++ Project managers Reinhard Lafrenz and Marie-Luise Neitz concerning the replacement of GIRAFF by MetraLabs

The confirmation – on behalf of the E++ coordinator – that MetraLabs is an adequate replacement for GIRAFF is herewith attached – signed by the E++ Project Managers Reinhard Lafrenz (scientific) and Marie-Luise Neitz (economic).

4) Follow-Up: Confirmation of MetraLabs concerning price and Haptics

Following up on the request for additional information on the easy integration of voice and haptics (mail of Cecile Huet dated 15.12.2015), MetraLabs has provided a confirmation by mail dated 16.12.2015, which reads as follows:

"Regarding HRI: The company focus is to build professional interactive service robots. We launched our first interactive robot in 2008. It was a mobile service robot that was able to guide customers to all products in large DIY stores. In the meantime we have produced more than 200 robots. They have autonomously driven more than 50.000 km in commercial applications. In respect to HRI we have sold the SCITOS A5 that operates in stores and museums to welcome visitors and customers and guide them. We are involved in a couple of European and national research projects in which we gained knowledge about how to design interactive robots that they support people at home or that they help patients in rehab hospitals to perform walking exercises.

Regarding the price: We could offer for the project a cost-optimized robot based on the SCITOS G3 platform which is also used for WeRobots. The price of the base platform incl. laser range finder, touch screen and a licence of our autonomous navigation software would be 15k EUR net plus costs for an customized enclosure that need to be developed during the project."