Global Software Development Education: A commercial perspective from a case study

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Abstract— Universities are starting to offer courses in Global Software Development (GSD) as a way to prepare future practitioners for challenges found in organizational settings. Companies also provide GSD training especially to new recruits who might lack skills in how to effectively communicate with people from different cultures and different first languages. However this training is costly and not necessarily tailored to the specific needs of the organization or individual practitioner. With a focus on GSD education, we have developed a training framework based on simulation that addresses different kinds of GSD problems. The framework allows course leaders to design training scenarios to fit their precise needs for improved communication and cultural awareness.

This paper presents a market-focused study aimed at discovering the requirements for a commercial GSD education tool. We studied the market options, identified key stakeholders, and conducted interviews with senior managers from three multinational companies. The study helped us to gain a deeper understanding of current training trends, needs and gaps according to key stakeholders. Finally, outcomes provided us with directions for future tool development.

Results indicate that industry find cultural differences a more pressing problem than linguistic differences. Although industry tends to use traditional (classroom based) training methods for raising cultural awareness, they perceive that interaction simulation is a viable alternative. Performance and potential cost savings are key drivers for commercialising prototype tools. Conducting market-focussed research can help to ensure our future research is relevant, and meets the needs of industry.

Keywords— global software development; distributed software development; training; education; market; commercial

I. INTRODUCTION

Global Software Development (GSD) education has become important not only for academia (in preparing students for the workplace) but also for industry, who need to ensure their employees are able to communicate and interact effectively in distributed settings [1], [2]. Preparing practitioners in the GSD field requires not only new theoretical contents but also new methods and tools that allow them to practice or be aware of specific scenarios.

Some universities provide GSD training by simulating software development project settings through collaborating with other universities across the globe [3] [4] [1]. This form of education requires a lot of commitment from those managing the courses, as well as time to set up and assess. In contrast, industry tend to educate their employees by taking advantage of their more experienced members to provide specific training [5], or employees learn on the job. Courses on areas such as culture tend to be generic, costly and require employees to take time away from their development tasks.

We propose an alternative training solution, VENTURE, for both academia and industry. VENTURE (Virtual ENvironmenT for commUnication and collaboRativE training) [6] is a virtual training environment that simulates realistic textual interactions between people in the workplace. This research and development started as a project initially oriented to the academic environment, however given that our training solution addresses important issues for GSD companies, we now conduct a market-focused study[1] as reported here.

In a world of open source and apparently free solutions, we need to take a giant shift to move from the research theoretical space into a forum where industry will pay for our products. As Dick Taylor noted in his article "Enabling Innovation: A Choice for Software Engineering" [7] we need more studies that carve out new industrial markets, build intellectual property, and may even influence economic forces. However, as Ian Sommerville [8] and Beecham et al. [9, 10] remark,

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[1] The Commercial Case Feasibility Support from Enterprise Ireland (www.enterprise-ireland.com) is a fund that Irish-based researchers can apply for to scope and develop a commercial case for their innovation.

there is a big gap between research results and practice. This study aims to close this gap by finding out exactly how we can move VENTURE from a research prototype framework to a competitive tool that is relevant to the training needs of GSD organisations.

In this paper we present an outline of how we studied the relevance of VENTURE for industry. We follow a business-focussed methodology that assesses the commercialization potential of research based projects. Semi-structured interviews were conducted with senior managers responsible for running large teams and organising training in multinational organisations. Each interview started with a demonstration of VENTURE, and resulted in identifying areas that are causing industry pain in their day to day operations and eliciting real requirements for training.

This paper is organized as follows: Section II describes the simulated-based framework. Section III describes the objective of the market-focused study, whereas the methodology applied to fulfill those objectives is explained in Section IV. The results related the product and technology are detailed in Section V. In Section VI we explain the outcomes of the preliminary market study. Section VII describes the outcomes of the interviews conducted. The results are discussed in Section VIII. Finally, the limitations and conclusions of this study are summarised in Sections IX and X respectively.

II. VENTURE

VENTURE [6] is a framework that makes it possible to simulate GSD interactions between students and Virtual Agents. Virtual Agents interact in an autonomous manner, in an attempt to perform certain GSD activities that lead the students to follow the lessons and guidelines provided in theoretical lessons. VENTURE applies a scenario-based learning approach [11] in which GSD interactive scenarios are reproduced.

Scenarios are accessed through an e-learning environment, which stores theoretical material of concepts (such as cultural rules) that can be practiced and reinforced by means of simulation where the student takes part in role-play. By interacting with this environment, students can track their activities and assess their progress. The automatic and manual assessments can also help instructors monitor their employees' strengths and weaknesses, and design new programs of study based on identified needs.

A scenario 'designer' facilitates the development of new teaching materials. This designer, which is integrated into the framework, allows the user to create new Virtual Agents (e.g. define their gender, accent, dress and gestures) and add new GSD problems and challenges for the students to tackle when interacting with the agents. However, a problem we researchers have when designing training simulations for industry is to reflect real and meaningful scenarios and problems. The framework therefore encourages the collaboration of the GSD community by including an upload facility on the website (http://global.lero.ie/Community) whereby interested parties can populate the framework with example problems.

VENTURE has the following components:

A. **Chat simulator**: allows students to train on synchronous interactions. The student's objective is to obtain as much information as possible from the Virtual Colleague within the time limit of the simulation. A Virtual Guide will provide students with instant feedback during the interaction. Both Virtual Agents make gestures according to the context of the conversation and speak aloud with an accent that matches their nationality in order to raise awareness.
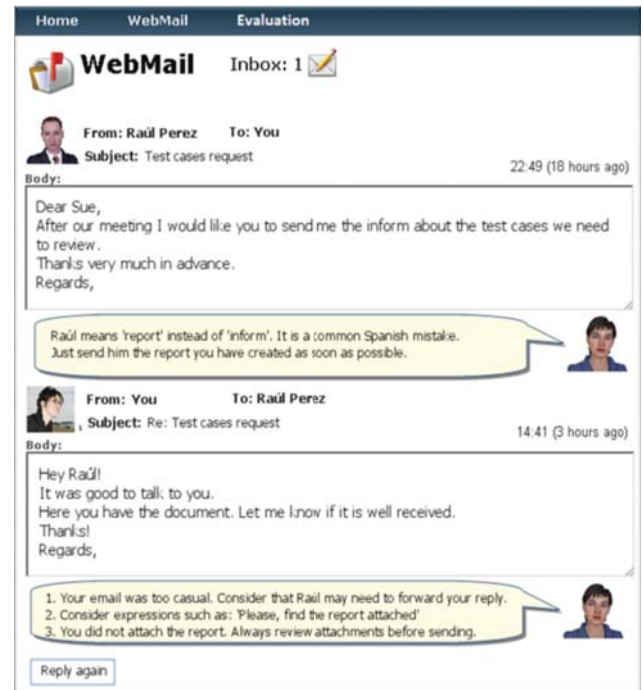

Figure 1. Email simulator

B. **The E-mail simulator** aims to simulate email interactions; this is important since email is the most frequently used form of asynchronous communication in GSD [12]. By using this simulator, students can receive messages from Virtual Agents and reply to them. Realistic delays in the answers can be simulated. Figure 1 shows an example of an email simulation. In this scenario, the Virtual Colleague (Raúl) starts the interaction by asking the student (Sue) to send him a document. It is assumed that in a previous chat simulation, both Sue and Raúl have discussed a set of test cases and Sue has a document available. In his interaction, Raúl included an ambiguous word (false friend), commonly used by Spaniards when speaking English. Maria (the Virtual Guide) automatically highlights the potential confusion this might cause to Sue. When Sue replies, three mistakes are detected by the Virtual Guide (and logged by the automated assessment). Sue is given immediate feedback and must correct her response before progressing to the next part of the scenario.

C. **The Scenario Designer**: This component is key to providing a service to pre-design scenarios for clients or for allowing clients to create their own scenarios. The current

prototype considers the design of different kinds of rules: conversation rules, cultural rules, linguistic rules and GSD specific rules. Examples of cultural rules are the direct/indirect communication rule [13] or the high /low context rule [14].

Team members will benefit from understanding preferred communication styles of the people they are communicating with, which might be indirect, and low context, for example.

D. **Assessment tool**: Students are automatically assessed through the training: Each student starts with 100%; however, each time they make a mistake a 'rule' is fired and marks are deducted. After each simulation they are given a written report that includes a final score, and a breakdown of each GSD skill trained in the scenario. The use of inappropriate or offensive language used during the simulation also deducts points. Questionnaires form part of VENTURE's manual assessment where students are encouraged to reflect on their progress and training.

Further details of these components can be found at http://global.lero.ie/venture.

III. MARKET-FOCUSED STUDY - OBJECTIVES

In moving from a research prototype to a market-focused tool we need to ensure that VENTURE is competitive and offers a unique solution. The aim of this study is therefore to uncover students, trainers and managers' requirements for a training solution through:

O1. **Identifying existing approaches and needs:** Identify any competitors, what they offer and how VENTURE compares. Identify the companies with training needs that match VENTURE's capabilities and identify gap.

O2. **Understanding potential stakeholders**: The different stakeholders involved in VENTURE (students, trainers and managers) from industry and training organizations need to be studied to discover their needs from a technical and content viewpoint.

O3. **Characterizing the market:** To tap into the market requires companies to be characterized according to their application domain and size. In addition, project characteristics must be defined such as potential number of users and geographic location. This will help define a business model that best fits the market. The profile of competitors' in the same business space along with existing patents is also explored.

O4. **Focusing on commerciality of the concern:** It is important to better understand how to create training scenarios adapted to companies' real needs. This will allow us to estimate the type of expertise required (e.g. domain experts for product development, or domain experts for content development).

O5. **Defining a Business Model**: The definition of the business model is open and projects a variety of ways that each of VENTURE's components can be used to fit the target market's needs. These projections need to be tested in the field for their feasibility.

O6. **Eliciting new requirements**: Identifying requirements of potential customers as to what they need for their training is essential to obtain a marketable product that fits stakeholders' objectives.

This paper touches on all objectives with a particular focus on GSD training needs of the market, as in O6.

IV. METHODOLOGY

This market-focused study was conducted during September-November 2013 by independent consultants (Versari[2]). Versari's methodology for conducting the market-focused study is comprehensive. For this study, a subset of their framework is applied to include: Product and Technology, and Customers, as depicted in Figure 2. This methodology does not specify a specific sequence of actions, as actions depend on the characteristics of the product and the market. The process is iterative.
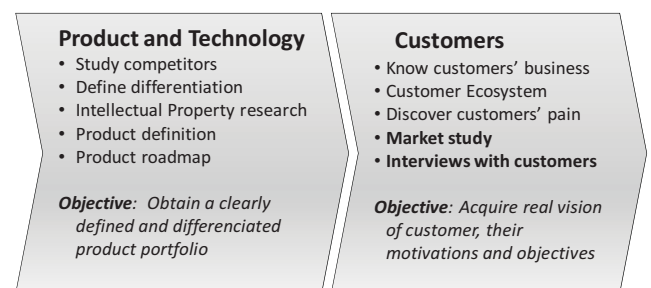
Product and Technology
- Study competitors
- Define differentiation
- Intellectual Property research
- Product definition
- Product roadmap

Objective: *Obtain a clearly defined and differenciated product portfolio*

Customers
- Know customers' business
- Customer Ecosystem
- Discover customers' pain
- **Market study**
- **Interviews with customers**

Objective: *Acquire real vision of customer, their motivations and objectives*

Figure 2. Section of VERSARI's Framework as applied

We adopt an open inductive approach to our data collection and analysis [15].

A. Data Collection

To collect data from practitioners we conducted an in-depth exploratory, qualitative survey using semi-structured interviews. The use of interviews gives us the flexibility to go deeper into unforeseen types of information that may emerge during an interview [16]. We used open ended questions with the aim that they would allow the conversation to flow freely and stimulate feedback and new ideas from the participants (the interview questions are listed in the Appendix).

Table 1. Organizations in our study

Organization	Head-Quarters	No. of employees
Lionbridge	Waltham, MA, USA	4,500
Accenture	Dublin, Ireland	281,000
Thomson Reuters	New York, NY, USA	60,000

We adopted purposive sampling for company selection. Purposive sampling involves selecting companies most representative of the population being studied [17]. In this case, companies engaged in GSD or training initiatives related to GSD training requirements (such as cultural and linguistic training) were selected.

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[2] Versari Partners (http://www.versaripartners.com/)

Basic company demographics are summarised in Table 1. The three participating organisations are described here:

Lionbridge Technologies Inc: provides translation, online marketing, global content management and application testing products. It is distributed across 40 centres in over 26 countries. Critically the company also works with more than 100,000 professional cloud workers that enable clients to successfully market, sell and support their products and services in global markets.

Accenture plc: is one of the world's leading multinational organizations providing management consulting, technology services and outsourcing company. It has offices and operations in more than 200 cities in 56 countries. Accenture sponsors activities that support teaming and learning so that its people can work more effectively across cultures. Understanding how to work in a cross-cultural environment and leveraging the diversity of multiple cultures is inherent to the corporate culture at Accenture.

Thomson Reuters Corporation: is a multinational media and information firm which includes the following divisions: financial and risk operation, legal, intellectual property & science, and tax & accounting. It operates in more than 100 countries. They support diversity and inclusion initiatives through a comprehensive, company-wide diversity strategy focused on driving positive change at all levels, from employees and managers to HR professionals and senior leaders.

Senior managers of the selected companies were interviewed. Participant 1 had over 15 years of experience of project management on teams involving 5-6 countries working together on globalisation projects. Participants 2 and 3 had more than 20 years' experience working in lead positions on global projects. Participant 2 is involved in cultural and linguistic training across multiple countries, working in cultural diversity and inclusion programs and experience in leadership. Participant 3 specialized in the definition, design and delivery of complex, large scale strategic change programmes with clients in the media, electronics, communication and technology sectors.

B. Research questions

The following research questions guided this study:

RQ1. Do GSD companies need training in communication and interaction?
    RQ1.1. If answer to RQ1 is yes, what are these needs?
RQ2. How do companies deploy their employee training?

RQ3. Has VENTURE the potential to meet the training needs of the market?

RQ4. What would make VENTURE more attractive from a commercial perspective?

C. Interview procedure

Two participants from the consultant company and three researchers involved in the project attended each industry interview. As not all the participants were based in Ireland,

meetings were conducted and recorded through a video-conference system.

Interviews took approximately one hour and were facilitated by the lead consultant. The other participants could intervene at any stage of the interaction asking additional questions when appropriate. Participants took notes on responses that were later transcribed.

Each interview started with a demonstration of VENTURE, going through all components listed in Section II. The training scope of the tool was not restricted to GSD but included related problems that multinational companies suffer relating to cultural and linguistic differences, diversity awareness, assertiveness, negotiation, leadership and sales. After the demonstration and introduction, a set of questions guided the interview (detailed in the Appendix) that included topics on the perception of VENTURE, the current training activities conducted in the companies and their needs.

Due to the qualitative nature of the collected data, we applied a thematic analysis methodology. Thematic analysis identifies concepts in narrative text, then synthesizes these concepts into major categories or "themes" that summarize the meaning of the text from a particular point of view [18]. To discover the current training needs and approaches applied in companies to determine the commercial options for VENTURE we took the following steps:

1. We identified which interview questions from our data collection addressed each of our research questions.

2. We sorted interview notes into answers to each of the interview questions, and further subdivided these answers into groups according to participant's company.

3. Authors examined each response and assigned a short phrase or code to identify the concept or concepts conveyed. Concepts and codes were created "on the fly" in a manner similar to open coding [19].

4. When all answers for a given interview question were coded, we examined the entire set of codes for a given interview question, and coalesced codes identifying similar concepts into broader themes.

5. Having identified major themes we mapped each fine grained code to the theme to which they belong.

V. RESULTS

This section summarizes results relating to the two sections of the Versari Framework described in Figure 2. We divide the findings according to the product, technology and competitors, and those that apply to customer needs.

A. Product and Technology

Study competitors: We asked our interviewees who they use to supply their training, and searched the web to identify potential commercial competitors. The market in this form of training looks vibrant with competitors producing training packages for cultural awareness, language, diversity, leadership, assertiveness and negotiation skills. The market

research identified a number of potential competitors that although they did not focus on GSD, provided training in related areas as summarized in Table 2.

Define differentiation: After studying the competition a key differentiator is VENTURE's use of a chat and an email simulator for providing training on synchronous and asynchronous interactions. Also, no competitors offered specific GSD training.

Table 2. VENTURE competitors

Competitors
GlobeSmart http://corp.aperianglobal.com
GlobeSmart provides the user with the ability to access detailed information on how to cope with a variety of cultural challenges they will face when dealing with people from differing backgrounds.
TMA World www.tmaworld.com
Online portal for cross cultural training. Personalised learning is provided and feedback is given on progress made. The business impact of training is measured by improved business communication, increased productivity, improved competence and improved working relationships.
Indisys www.indisys.es/en
Locuaz is an artificial brain that comprises advanced Artificial Intelligence and Cognitive Science strategies to offer intelligent, flexible and natural conversations. It combines Machine Learning and Rule-Based approaches oriented to customer assistance purposes. It uses 3D Avatars.
ALELO www.alelo.com
Originally developed in the military field. It uses role-play simulation technology to develop computer-based and mobile solutions for training global competence and intercultural communication. Alelo uses multi-option story techniques.
Richard Lewis Communications www.crossculture.com (49 employees)
Provides an integrated portfolio of services in the areas of language, communication skills, and cross-culture.
Empower the User (ETU) http://www.etu.ie (4 employees)
ETU's RolePlay Development Tool allows anybody with subject expertise to develop assessment and training role-play simulations. A drag-n-drop interface makes it easy the design. The tool can be used to build role-play simulations for sales, customer services, leadership, communication skills, soft skills or professional development.

Intellectual Property research: We conducted searches in the Google Patents database to check for current patents that could conflict with VENTURE. We found **Virtual Assistants** appear in several patents. However the current patents are different to the VENTURE concept as they do not capture the context of the interaction, do not use a Virtual Guide or do not focus on training. There are also patents related to **natural language**, however they are not related to a context sensitive rule-based engine able to detect linguistic or cultural problems. **Linguistic training** is covered by some patents but these use a different technology.

B. Customer

Know customers' business: The objective of this stage is to understand the customers' point of view. Companies involved in the study are described in Section IV.

Determine customers' ecosystem: The methodology ensures that customers' needs are clearly defined and addressed by the solution. The different roles involved in the organization can benefit in different ways from what VENTURE has to offer. In addition to the Organizational Customer (purchaser), key stakeholders such as the student, the manager, and the instructor or curriculum designer can take advantage of VENTURE, as depicted in Figure 3:
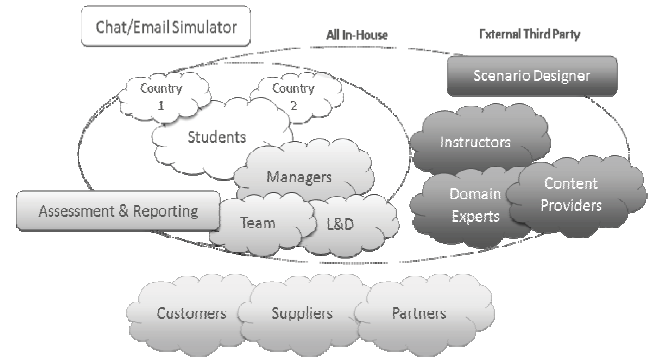

Figure 3. VENTURE´s customer ecosystem

Discover customers' pain: Table 3 summarises the critical "pain points" for the different stakeholders involved, as analysed by the researchers. These points form the key inputs to future product and marketing decisions.

Table 3. Customers´ pain points

	Pain points
Student	**I dislike**: - Studying theory without discovering real cases for its application - Exposing my weaknesses in public **I would like**: - More practices and less theory - Know real cases in which theory can be applied - Guidance on how to tackle my weak points
Trainer	**I dislike**: - Taking too much time to design training - Too many options for the user. (The many different ways to express the same thing is confusing) - Difficulty of the design of new training scenarios - Long learning curve for getting use to the designer **I would like**: - A broad set of scenarios that could be reused - A database with patterns, problems and scenarios - Being able to design scenarios that reproduce actual problems that happen on the organization - Cost savings: reusability of content - Reproduce critical situations, discussions - Provide training on communicative soft-skills that are difficult to train with other means
Manager	**I dislike**: - Having to make personal comments about someone's culture - When students who need to work on a team don't understand each other

I would like:
- If I could easily find areas where students need support
- Having a fair and objective way of assessing students
- If the topic is very related to the training objectives
- If the topics are very related to real life problems
- Adaptability to different students' needs
- Training on soft-skills not possible by other means
- Training on real problems that have happened previously
- To comply with regulations
- To be able to demonstrate that learning took place

VI.   MARKET STUDY – BUSINESS DRIVERS

This part of the study is based on an analysis of our interview data, advice from our business consultants, and literature and web searches. Three business drivers characterize the gap VENTURE fills:

Venture Driver 1 - Economic Growth from Emerging Markets: Currently, emerging markets represent 80% of world population but only 30% of global economic output. Asia, Latin America (Spanish and Portuguese speakers) and South Africa are predicted to become dominant economies by 2050 [20]. VENTURE can help organizations get up to speed with their need to train their employees to communicate effectively. Equipping employees with this awareness will minimize the risk of project failure and improve productivity.

Venture Driver 2 - Growth in training needs: According to the previous point, the majority of future global economic growth is predicted to come from non-English speaking markets. Significant cultural differences exist between these emerging markets and more developed economies. These changes go hand in hand with the need for new interaction skills. For example, interactions between Europeans and Indians can be problematic [21] where there are reports that the tendency to always agree can mask problems [22]. This was also identified as a problem in our interviews with senior managers. Knowledge of this cultural difference, as supported by VENTURE, will aid each party to communicate effectively and set realistic expectations. A poor understanding of cultural differences can create delays and conflicts that can detract from the main tasks, and propagate into larger problems over time [13].

Venture Driver 3 - Growth in Online Collaboration in Workplace: Office workers spend an average of 28 hours a week writing emails, searching for information and collaborating internally [23]. There is a growth in employees choosing to use email rather than speaking to a colleague in real time [23]. New skill sets are required for people operating within virtual teams - for both managing the team and for operating effectively within the team. The issues involved within virtual teams can be magnified when the participants come from different cultural backgrounds and/or have different first languages.

Typical interaction problems that occur when using chat and email include: misunderstandings and misinterpretations, long waiting times, conflicts due to a lack of face-to-face contact, lack of experience dealing with specific topics, inappropriate composition of the messages due to linguistic

problems or lack of understanding, or lack of compliance with company norms.

A. Identify priority market

The priority market of VENTURE is the Global Talent Management industry that is experiencing significant growth at present. Workforce collaboration and performance are generally influenced by cultural issues which can be applied to different domains.

Table 4. VENTURE niche sectors

The primary route to exploitation varies across the key sectors. Examples of some niche markets within the Global Talent Management area are identified in Table 4. Each niche has its own Domains and Rules that VENTURE could support. For example, some of our senior managers suggested that culture, language, and motivation training could be needed in sectors such as HR or Management where functional heads suffer from efficiency or productivity issues.

VII.   CUSTOMER FEEDBACK

This section summarises the feedback received from the senior managers interviewed. Information on our sample, data collection and analysis methods is given in Section IV (A).

Market needs

Interviewees report that significant issues do exist in companies due to culture and language differences between stakeholders who need to interact. Statistics point to numerous projects where there were severe delays and rework where scope was misunderstood due to culture and communications issues between the international team. One of the participants estimates that 2-3% of delays are due to culture and language differences. All the participants agreed that these issues are primarily cultural as opposed to linguistic. For example, according to our interviewees, practitioners from India have a tendency to say yes even if they don't agree; as supported by the literature [22]. However Chinese practitioners similarly will agree so as not to lose face.

One interviewee noted that what counts is experience working with international teams as well as a good process and training system. These can considerably reduce problems stemming from cultural diversity.

Communication tools used

Email is the primary communication tool used, followed by instant messaging (Microsoft Lync). Voice conversations are conducted via Web-Conferencing (applications such as WebEx) rather than telephone. Interactions often start with Instant Messenger and then switch to a voice session with screen sharing.

Development teams use project management systems and bug management systems established in the company that incorporate communication tools. Additionally, two of the companies use proprietary tools for synchronous communication and one reported the use of corporate blogs and social collaboration networks like Yammer.

One of the interviewees suggested a possible overuse of instant messaging and training on best practices should be considered to promote preferred methods. Another company reported that they apply a strict communication policy, and all interactions are stored for audit purposes.

Current training

The three companies all provided cultural training to their employees. One of the companies has recently added cross-cultural diversity to its training programmes. This confirms the view that they now see cultural diversity as critical to improved practices. All employees have online access to the training programme, including information on global business effectiveness.

Another company confirmed that their cultural programs were available to all employees, and incorporated into the company's policies and procedures. Online training and coaching on cultural differences is provided to all members.

Two of the companies provided role play exercises that are carried out with mentor support. These programmes are adapted to suit the business needs of each client mapped to a number of appropriate dimensions for business (following a similar concept to House et al. [24] or Hofstede [21]). As an example, one of the companies provides training in sales enablement in which cultural differences are a key element in communication. This company currently develops role play activities for reproducing typical situations that a sales person would face – e.g. dealing with a difficult customer, how to close the sale in different cultures, or avoid certain expressions that could have a negative impact on the customer. However, role play activities were reported to be very time-consuming, with no way to measure and collect data from the training experiences.

VENTURE Challenges

According to the interviewees, before commercializing VENTURE, we need to consider the following:

- The look and feel needs to be a lot slicker, and professional looking. Improving the user interface was identified as a key point for improvement by all interviewees.
- Current training objectives are too broad. It is necessary to identify the right niche, and the most important culture/languages and dimensions for the chosen markets.

- VENTURE needs to be differentiated from other products.
- The design of scenarios and reuse of information needs to be simplified. It is important to have building blocks that someone with limited technical expertise could use to create relevant and new scenarios.
- There could be a real market need for VENTURE if it could deliver real time feedback (to both the end-user and trainer) on their communication and interaction. An idea would be to embed the software into existing communication tools (instant messaging and email systems). For example, when users are composing a message for someone from a certain culture, the system could provide guidelines and recommendations.

VENTURE Comments

The following comments were made by the interviewees relating to the various VENTURE components:

- The use of avatars could not be justified. As found in the market study, it would require a significant investment to compete with existing 3D solutions and other avatar-based systems.
- The scenario designer was well valued by interviewees, as it can reduce the time and guide the design of well-known problems.
- One interviewee felt that there could be a real market need for VENTURE if it could deliver real time feedback (to both the end-user and trainer) on their communication and interaction.

VIII. DISCUSSION

This section discusses the main findings of the study according to our research questions.

> *RQ1. Do GSD companies need training in communication and interaction? - If yes, what are these needs?*

This study found that communication and interaction training is important to industry, particularly cultural training.

Training areas covered by companies that relate to Global Software Engineering are diverse to include: diversity, assertiveness, leadership and negotiation. Additionally other markets such as those where teams need to interact with people from different cultures such as call centres provide specific training on how to interact in a proper manner by adjusting to the organizational rules and culture.

> *RQ2. How do companies deploy their employee training?*

Training programmes on cultural awareness are delivered via traditional classes, e-learning based training, role play activities, 3D virtual environments, and video based content. These are the most common approaches for training in interaction and communication skills related to GSD.

> *RQ3. Has VENTURE the potential to meet the training needs of the market?*

VENTURE has the potential to be a good substitute for traditional role play activities performed in a classroom setting.

The current role play scenarios applied by companies could be translated into VENTURE training scenarios, avoiding the need for instructors to facilitate the sessions. Features such as simulated role-play and automated assessment offered by VENTURE are likely to result in considerable time and cost savings. Additionally, VENTURE offers a cheaper alternative to existing 3D environments, which require considerable investment to customize.

A set of training related concerns and wish lists were analysed (see Table 3). All these pain points are covered by VENTURE. All respondents confirmed that providing accurate assessment at an individual level is critical. The ability to provide immediate feedback and report the learning achieved was conceived as a key value of VENTURE. Similarly, the ability to easily generate training scenarios through the Scenario Designer is considered an important factor for commercialization, as it provides a way to customize training to reflect the organisation's learning objectives. For example, for an employee working in sales, it is important to adopt the customer's terminology and figure of speech. But, for a software developer interacting in a virtual team, it is more important to have the least ambiguous communication and terms.

RQ4. What would make VENTURE more attractive from a commercial perspective?

In order to obtain a competitive training environment, partnering with content and technology providers was suggested by an interviewee with the objective of: 1) embedding the technology into existing communication tools, and 2) to generate scenarios that can consider language and culture expertise. Specifically, it would be of interest to consider those role-play activities that companies are applying.

A further key point raised in the interviews, was to limit the commercial scope by identifying the most critical languages within the priority sectors (considering both geographic and industry markets).

Finally, the following points summarize the key factors for meeting companies' requirements as discovered in this study:

- Training environments that are easy to implement, where minimal effort, resource and cost is required to generate content and to maintain the platform.
- Customization capabilities to obtain a solution adapted to customer needs. For example, in the training field, customers need to be able to provide training on problems that they have documented.
- Comply with regulations: companies usually need to demonstrate that they have provided specific training in certain topics. They need to provide this training in a way that is traceable and can prove that the user/participant understood the concepts.
- In accordance with previous observations [25], practitioners do not really want to apply new frameworks, but would rather have new tools that can be adapted to their existing frameworks or systems. In the training field, they want solutions and patterns to train employees on context specific problems. Solutions need be standalone with an option to be integrated into the customer's existing applications (in our case, into email clients, and IM).

IX. LIMITATIONS

Construct validity. Construct validity in this study concerns whether the questions we ask actually capture the participants' feelings about GSD training topics. Our interview questions were designed to investigate the commercial potential of VENTURE, following a business focused methodology, and lead by a business consultant; as such we feel confident that the questions asked capture the aims of the study.

Internal validity: Internal validity in this study is concerned with whether we accurately recorded the responses, - i.e. do the notes written up by the researchers truly reflect the responses, and then do we synthesize and interpret those notes correctly? When interviews are recorded participants may feel uncomfortable [26, 27]. However, the flow of the conversation was not personal, and competency was not challenged. Participants freely criticized the tool and therefore we feel assured that they were not holding back.

A further aspect to consider is the accuracy of the participants' answers. However the interviewees all appeared comfortable and provided clear responses that included both positive and critical assessments of VENTURE, leading us to believe that the practitioners in our sample gave us frank answers to our questions. The interviews were in depth, taking approximately one hour. The semi-structured nature of the questions allowed us to group the answers according to our research questions for ease of analysis. Also, we followed a clear, tried and tested methodology to derive our themes (see methodology section).

External validity: The sample size is small, when compared to the size of the population of all GSD organisations and practitioners. We therefore do not attempt to generalise our results to the larger population, as our sample may not be representative of the population. However, the sample was chosen to cover experience in cultural and linguistic training, assertiveness, negotiation and leadership skills, and GSD related skills. All these aspects were covered by the participants in this study, all of whom collaborate across borders.

X. CONCLUSIONS

Discovering what the GSD training market is demanding and offering is key to planning future steps in our research and tool development. In this paper we presented a market-focused study based on a GSD training environment. The needs of the market and the current trends in training approaches were investigated. A major result is that the market for cultural training will grow in the following years. The results of this study are potentially helpful for defining or aligning future research projects. In other fields, assessment of commercial feasibility is integrated into studies as a prerequisite to assure the relevance of research [28]. The method applied for conducting the study is generic and potentially applicable to other market studies derived from research.

When working on research projects we suggest that factors such as the cost/benefit, customization, and integration with

existing systems are also considered. In order to move from a theoretical tool to one that could, with a little investment, become a commercial reality requires a shift in mindset. The core idea must be clearly differentiated not only from the existing research, but also from the other commercial offerings.

After identifying competitors to the VENTURE solution, we found that although no specific GSD training is commercially available, there is a big market in the fields of cultural and linguistic training, as well as other fields related to GSD such as leadership or assertiveness. Meetings with companies provided a reality check, giving us insight into the real options for our tool. This included challenges and improvements to implement a more competitive alternative that could address customers' pain points. Ensuring that we had a good working prototype before embarking on a commercialization study was viewed as a key success factor.

So, what are the recommendations for researchers wanting to move from theoretical models and tools into practice? If we as researchers want to move from theory to tool to application in practice, we need to think carefully about the following: Why should industry invest in our solution? Why should they spend time in helping us to develop our frameworks and tools? Articulating the pain points (what is really hurting/problematic) and matching the pain with workable solutions will achieve two key outputs: 1) real issues are recognized and made explicit, 2) potential requirements and challenges are recognised. These requirements are not necessarily going to be complete, consistent or achievable, but that is how we innovate and push the boundaries.

Future efforts will be focused on providing a commercial version of VENTURE, in which the user interface will be improved, and useful training scenarios will be designed. These scenarios must reproduce specific problems that happen in the company and solve a specific training need.

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APPENDIX

Culture and Language
- Can you briefly describe your role in relation to managing global teams?
  - Where does this role fit in the wider organisation?
  - What other roles would have ownership (either functional or 'L&D') of cross-cultural / global issues?
- Do you agree that there are frequently issues relating to differences in language and culture across the team? Can you give any discrete examples?
- Do you have any way of quantifying the costs of these issues?
- Are you aware of any studies that have quantified these costs?

Communication and Collaboration
- What communication tools do you use within your global team?
  - Voice (Phone, Skype), Email, IM
  - Document Sharing – SharePoint, Dropbox, etc.
  - Web Conferencing – Webex, GoToMeeting, etc.
  - Others
- Which tools would you say are used most within your global teams?
- Do certain members prefer certain channels of communication? Does this vary by culture?

Existing training solutions
- What training do you currently carry out to address the needs of your global teams?
- Do you specifically train team members in relation to culture or language diversity?
- Do you use e-learning tools?
- Do you use simulation tools?
- Do you have a view on:
  - The pros and cons of existing solutions?
  - Ideas about what better solutions might look like?
- Do you know if there is a budget for this type of training solution? If so is it owned by L&D or functional management?
- How easy is it to buy innovative solutions for learning?

About VENTURE
After the presentation of the slides describing the proposed VENTURE solution:
- Would you see value in the proposed VENTURE solution?
- Do you think the training department or the managers responsible for managing global teams would purchase this solution?
- How much do you believe they would pay for a solution like this?
- Are you aware of any competitive solutions?