

A Competency Model for Customer Representatives in Agile Software Development Projects

In an agile software development project, customer representatives (CRs) have explicit and implicit responsibilities that facilitate the creation of software to meet evolving customer needs in a timely manner. We describe a competency model for effective CRs that was developed following interviews with four agile development teams. The model comprises 10 competencies grouped within three competency areas: Business, Socio-Relational and Systems. We provide recommendations for CIOs on how to use the model as a tool for communication, education and training, performance assessment and diagnostics.^{1,2}

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Lack of a Competency Model for Customer Representatives in Agile Development Projects

In dynamic business environments, where customer requirements change frequently, agile development methods have emerged as a viable and effective approach for information systems development (ISD) projects to create working software that meets those requirements.³ One of the primary means by which agile methods produce software functionality that is closely aligned with customer requirements is through the role of a designated customer representative (CR). This role has different names in different agile methods—e.g., on-site customer in Extreme Programming (XP)⁴ or product owner in Scrum⁵—but whatever the title, the person appointed is expected to assist the ISD team with development while ensuring that customer requirements are met.



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³ Agile development is an iterative approach to ISD that emphasizes the production of working software in small releases. See Fowler, M. and Highsmith, J. "The Agile Manifesto," *Software Development* (9:8), 2001, pp. 28-35 for a discussion of the underlying philosophy of agile development.

⁴ Beck, K. "Embracing Change with Extreme Programming," *Computer* (32:10), 1999, pp. 70-77; and Beck, K. *Extreme Programming Explained: Embrace Change*, 2000, Addison-Wesley.

⁵ Schwaber, K. and Beedle, M. *Agile Software Development with Scrum*, 2005, Prentice Hall; and Pichler, R. "Common Product Owner Traps," 2010, *Scrum Alliance*, available at <http://www.scrumalliance.org/community/articles/>.

CRs are assigned explicit and implicit responsibilities within an agile ISD project.⁶ Failure to satisfy these responsibilities has adverse effects on development outcomes, leading to substantially increased development costs, delayed software releases and erroneously implemented business functionality.⁷ Broad consensus exists among practitioners and academics about the importance and impact of the CR role in agile ISD projects: “*The success of agile development hinges on ... customers who will actively participate in the development process.*”⁸ Given the importance of the CR role, it comes as a surprise how little is formally known about the role. Specifically, there is scant knowledge about the competencies CRs require so they can effectively perform the role and carry out the assigned responsibilities.

Information about required competencies is normally captured in competency models through detailed descriptions of the required skills, knowledge, attitudes and traits a person needs to effectively perform a particular organizational role.⁹ Databases for competency models, such as the U.S.-based *Occupational Information Network (O*Net)* or the U.K.-established *Skills Framework for the Information Age*, offer a plethora of models for all kinds of occupations. Yet no such framework or competency model currently exists for CRs in agile ISD. This gap may exist because the CR role is not a classic job role for which an organization’s HR department externally recruits.

6 These responsibilities include, for example, providing requirements and performing acceptance tests, as well as liaising and maintaining trust with various organizational stakeholders. See Martin, A., Biddle, R. and Noble, J. “The Customer Role in Practice: Three Studies,” *Proceedings of the Agile Development Conference*, 2004, pp. 42-54.

7 In a study of agile ISD projects in the U.S. and New Zealand, Hoda and colleagues found that important business functionality was erroneously implemented when CRs did not prioritize requirements and delayed responses on how to implement requirements. See Hoda, R., Noble, J. and Marshall, S. “The Impact of Inadequate Customer Collaboration on Self-Organizing Agile Teams,” *Information and Software Technology* (53:5), 2011, pp. 521-534.

8 Nerur and colleagues came to this conclusion when researching the challenges that an organization faces in migrating to agile methods. See Nerur, S., Mahapatra, R. and Mangalaraj, G. “Challenges of Migrating to Agile Methodologies,” *Communications of the ACM* (48:5), 2005, pp. 72-78. However, they note that identifying such a suitable CR is not an easy task.

9 See McClelland, D. C. “Testing for Competence Rather than Intelligence,” *American Psychologist* (28), 1973, pp. 1-14. This is the seminal work about the elements of competency models, but the HR literature lacks a cohesive definition of a competency model, making the creation of such a model more of an art than a science.

For classic job roles, organizations typically rely on a competency model for advertising and interviewing for a position. The fact that a CR is only temporarily assigned to an agile ISD project might be another reason why no such competency model exists.

However, without a CR competency model, diffuse and potentially conflicting understanding can emerge about the knowledge, skills, attitudes and general dispositions that CRs need to have. Left unmanaged, this can make the involvement of a designated CR in an agile ISD project counter-productive and, as mentioned above, can adversely affect the project, the ISD team and the customer.

To fill the gap, this article describes a competency model for CRs that is based on key activities they perform to satisfy the different role responsibilities in agile ISD. The research for this article comprised interviews with representatives in four agile ISD teams in two Australian companies. To preserve their anonymity, we refer to them as Sparkasse and Werkstatt. (The Appendix contains further information about the research method.) The competency model was developed from the interview data and includes three broad competency areas: *Business*, *Socio-Relational* and *Systems*, each of which includes a set of competencies. This multi-dimensional competency model can be used by CIOs as a tool for identifying, communicating, evaluating, educating and training employees to ensure their effectiveness in the CR role.

Different Responsibilities of Customer Representatives in Software Development Projects

Different Forms of Customer Representative in Software Development Projects

Customers have long participated in ISD projects—even before the emergence of agile methods. However, as illustrated in Table 1, CRs play a more prominent role in agile development than in traditional approaches and, therefore, a CR has the potential to have a far greater influence on the agile development process.

Table 1: Customer Representation in Traditional and Agile Software Development¹⁰

Characteristic	Traditional Projects	Agile Projects
CR Contribution	Punctuated contributions at specific points in time; normally at project inception and at the end to accept and approve deliverables	Continuous contributions to the team and the customer/organizational entities throughout the ISD project
CR Affiliation	CR retains existing departmental workspace and responsibilities; serves as an external resource to the ISD team	Under perfect conditions, the CR is physically co-located with the ISD team for the entire project; participates as a full-fledged member of the ISD team
CR Interactions with Team and Customer	Formal, infrequent interactions; communication is heavily biased toward documentation	Informal, frequent interactions with face-to-face communication, light documentation

The key difference with agile development stems from the openness to changing requirements coupled with short development cycles that lead to differences in how knowledge is created and transferred between the ISD team and the customer.¹¹ Because intensive face-to-face communication is the preferred *modus operandi* in an agile project—where knowledge is mostly tacit and needs to be contextualized with minimal documentation¹²—prominent agile practitioners advocate having a dedicated and co-located CR. While co-location is required in XP, other agile methods are not so prescriptive. This is largely because agile academics and practitioners caution that insistence on a full-time CR may cause customers “to supply the person who is most expendable.”¹³

Customer Representative Responsibilities in Agile Development Projects

In agile ISD projects, CRs face a broad set of responsibilities that are either explicitly or implicitly assumed to be part of the CR role. As Figure 1 illustrates, the explicit responsibilities of CRs relate to providing requirements and evaluating software quality.¹⁴ Defining project scope and outlining the functionality of the software has traditionally been a CR task. Specifically, specifying requirements has been portrayed as a collaborative process between the CR and ISD team, which allows shared mental models to emerge.¹⁵ Similarly, evaluating the outcomes of an ISD project after delivery has also traditionally been performed by the customer. Yet, with the agile model, these activities are undertaken repeatedly in each cycle, allowing for changes to the software throughout the project. In the eyes of the customer department, the CR becomes the logical choice for these responsibilities because of the frequent interactions and co-location with the ISD team.

In addition to explicit responsibilities, the CR has two key implicit responsibilities: liaising

¹⁰ The comparison in the table is based on Nerur, S., Mahapatra, R. and Mangalaraj, G., op. cit., 2005, expanded by Dybå, T. and Dingsøyr, T. “Empirical Studies of Agile Software Development: A Systematic Review,” *Information and Software Technology* (50:9-10), 2008, pp. 833-859.

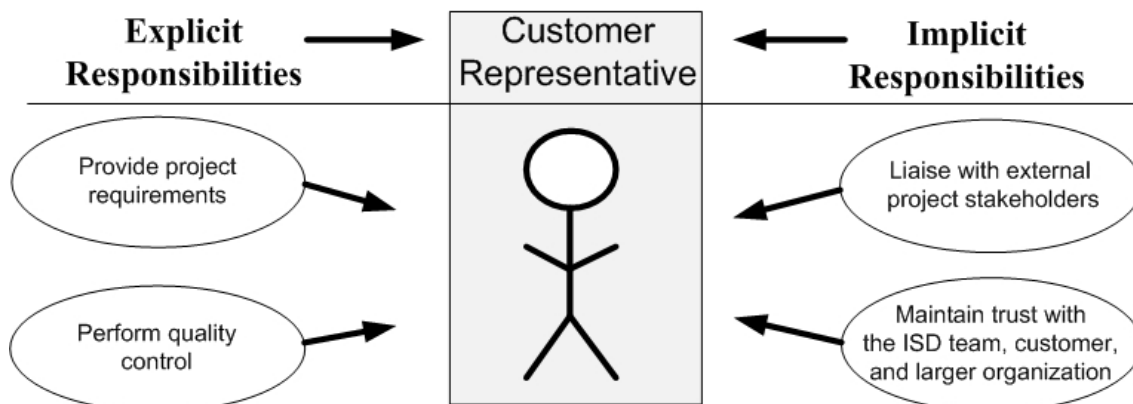
¹¹ Sarker, S. and Sarker, S. “Exploring Agility in Distributed Information Systems Development Teams: An Interpretive Study in an Offshoring Context,” *Information Systems Research* (20:3), 2009, pp. 440-461.

¹² See Highsmith, J. and Cockburn, A. “Agile Software Development: The Business of Innovation,” *IEEE Computer* (9:34), 2001, pp.120-122, which describes communication patterns between the agile ISD team and the customer representative.

¹³ See Boehm, B. and Turner, R. *Balancing Agility and Discipline: A Guide for the Perplexed*, 2004, Addison-Wesley, p. 44.

¹⁴ For a discussion of the explicit CR responsibilities, see Martin, A., Biddle, R. and Noble, J., op. cit., 2004; and Ramesh, B., Cao, L. and Baskerville, R. “Agile Requirements Engineering Practices and Challenges: An Empirical Study,” *Information Systems Journal* (20:5), 2010, pp. 449-480.

¹⁵ The requirement-specification process is examined in detail by Chakraborty, S., Sarker, S. and Sarker, S. “An Exploration into the Process of Requirements Elicitation: A Grounded Approach,” *Journal of the Association for Information Systems* (11:4), 2010, pp. 212-249.

Figure 1: CR Responsibilities in Agile Development Projects

with other organizational stakeholders (top-management, steering committees, funders and other departments) and maintaining trust with the ISD team, the customer and the larger organization.¹⁶ Liaising with various organizational constituents ensures their points of view are considered and their requirements for the system being developed are understood. Such liaising also obtains support for, and commitment to, the project. Maintaining trust leads to cooperative behaviors, a reduced need for control of task-fulfillment and increased ability to confront performance problems. Trusting in the CR requires believing the person is competent, acts with integrity in the interests of the ISD project and exhibits consistent behaviors.¹⁷

To fulfill the two explicit and two implicit responsibilities, CRs are expected to perform various activities within an agile ISD project. However, academic writings and practitioner reports lack comprehensive accounts of the CR role and what CRs need to do in an agile project. Such an understanding is crucial if the ISD community is to understand which competencies a CR should possess. Thus, insights into CR activities are a key prerequisite to developing a competency model for CRs.

The Need for a CR Competency Model

Competency models are detailed descriptions of the skills and knowledge (overt competencies), and attitudes and traits (covert competencies) necessary to be effective in an organizational role or position.¹⁸ Competencies describe abilities and the expected behaviors needed to perform an activity or process in a competent manner.¹⁹ Companies traditionally use competency models for recruitment, appraisal, training and staff planning. These models make it possible to determine how well a person performs in a role and to outline learning needs to improve the effectiveness of the position holder.²⁰

Over the years, different approaches have emerged for developing competency models, including:

- Developing the model from scratch for a particular job
- Adjusting an existing competency model for a similar position within the organization

16 For details on the implicit responsibilities of CRs in agile projects, see Martin, A., Biddle, R. and Noble, J., op. cit., 2004.

17 McKnight, D. H., Cummings, L. L. and Chervany, N. L. "Initial Trust Formation in New Organizational Relationships," *Academy of Management Review* (21:3), 1998, pp. 473-490.

18 Mansfield, R. S. "Building Competency Models: Approaches for HR Professionals," *Human Resource Management* (35:1), 1996, pp. 7-18.

19 Skills express what a CR should be able to do—i.e., a learned capability; knowledge expresses what a CR should know—i.e., facts, concepts and information; attitudes express how the CR feels—i.e., values and beliefs; and traits express a CR's dispositions and physical characteristics. However, so far no accepted distinction between the terms has surfaced in management research.

20 Lucia, A. D. and Lepsinger, R. *The Art and Science of Competency Models*, 1999, Jossey-Bass.

- Creating a model using extensive pre-populated competency libraries from which a set of competencies is chosen.

Irrespective of the approach used, details on the role's activities need to be known before the associated competencies can be derived. When starting from scratch, these activities are obtained through extensive interviews and observations. The other two approaches rely on existing competency models of similar job positions that are then altered for the new role.

IS researchers have developed competency models with a particular focus on skills for roles such as IT managers, service providers or general IT professionals. These models are based on publicly available job advertisements, in-depth interviews or existing skill libraries. Lee and Lee examined 555 job advertisements of Fortune 500 companies to create a library of skills for IT managers, with categories such as technical skills, business skills and systems skills.²¹ Recently, Hawk and colleagues collaborated with the Society for Information Management to elicit and compare the skillsets required of IT service providers and their customers. Through interviews with senior IT executives, they were able to identify four different categories—technical skills, project management skills, business domain skills and sourcing (i.e., buying and selling).²² These studies showed that IS roles, even managerial ones, require technical and business skills. A study by Chakraborty and colleagues identified the skills and knowledge used by user representatives in the requirements-specification process.²³

However, the agile development literature has ignored the need for a broader mix of skills and knowledge for CRs. This underscores the need for a competency model for CRs. In an effort to create this competency model, based on empirical data gathered from four agile ISD projects, we now present the key CR activities categorized under

the explicit and implicit responsibilities, and subsequently derive the CR competency model.

CR Activities in Agile Development Projects

The explicit and implicit CR responsibilities in ISD projects and the associated 11 CR activities are described below and summarized in Table 2.

Explicit CR Responsibilities

Managing Requirements. An explicit CR responsibility is to perform activities that are focused on managing the software requirements. As our study data shows, this includes providing, clarifying and prioritizing requirements. The CR assists with defining the scope of the ISD project and identifies a set of high-level requirements that later, in collaboration with the ISD team, are decomposed into more detailed user story cards. We also found that CRs' ongoing clarifying and prioritizing activities provide clarity on the meaning of requirements and how best to implement them. Drawing on their business-domain knowledge, CRs fill gaps in the story cards and explain complicated but essential product features. Our interviewees mentioned that misinterpreted or misunderstood requirements would delay the project due to the need to rework erroneously implemented requirements, resulting in extra project costs.

"As soon as you get into the documentation, that's always going to be open to interpretations, so there's nothing better than clarifying and simplifying with communication; so that's the key, I guess, for things to have a high quality." (Developer, Werkstatt Team 2)

"We do need to have more details in some of the stories, because otherwise developers could think that's what the business wants, and not quite get it right." (Project manager, Sparkasse Team 2)

Managing the list of requirements and deciding on the priorities of each requirement is driven by the importance of a feature. We found that CRs perform this activity through a process of critical thinking based on their understanding of how the business operates (domain and process knowledge). Occasionally, when faced

21 Job advertisements were the main data source used in Lee, S. M. and Lee, C. K. "IT Managers' Requisite Skills," *Communications of the ACM* (49:4), 2006, pp. 111-114, whereas a questionnaire with a predefined skillset was used by Bassellier, G. and Benbasat, I. "Business Competence of Information Technology Professionals: Conceptual Development and Influence on IT-Business Partnerships," *MIS Quarterly* (28:4), 2004, pp. 673-694.

22 Hawk, S., Kaiser, K. M., Goles, T., Bullen, C. V., Simon, J. C., Beath, C. M., Gallagher, K. P. and Frampton, K. "The Information Technology Workforce: A Comparison of Critical Skills of Clients and Service Providers," *Information Systems Management* (29:1), 2012, pp. 2-12.

23 See Chakraborty, S., Sarker, S. and Sarker, S., op. cit., 2010.

Table 2: CR Activities in Agile ISD Projects

Responsibility	Description	Detailed Activity
Explicit Responsibilities		
Managing Requirements	Responsibilities associated with managing requirements	1) <i>Identification</i> : CR identifies requirements 2) <i>Clarification</i> : CR clarifies requirements 3) <i>Prioritization</i> : CR prioritizes requirements
Managing Quality	Responsibilities associated with evaluating project deliverables through feedback loops	4) <i>Acceptance Testing</i> : CR provides planned feedback through testing and approves requirements 5) <i>Ad-hoc Feedback</i> : CR provides spontaneous and unplanned feedback on requirements
Implicit Responsibilities		
Liaising with Diverse Organizational Stakeholders	Responsibilities associated with managing the interface and resources between the ISD team and the wider organization	6) <i>Removing Roadblocks</i> : CR removes roadblocks to ensure barrier-free development 7) <i>Allocating Resources</i> : CR allocates resources to iterations and requirements 8) <i>Facilitating Resource Acquisition</i> : CR supports and performs resource requests
Managing Trust with the ISD Team and the Wider Organization	Responsibilities associated with managing trust and the social bonds related to members of the ISD team and the wider organization	9) <i>Motivating</i> : CR motivates the team to continue with development effort 10) <i>Empathizing</i> : CR expresses support and concern for the team's well-being 11) <i>Evangelizing</i> : CR trumpets the team's achievement throughout the company

with various alternatives or when the CR was not sure about a requirement, he or she also needed to consult with the relevant customer department.

"We [developers] would go to him [the CR] and say we'd like to do it this way, and then he would take that, listen to our feedback and then he would say, okay, I need to take this away and double-crunch it and think about it. And we knew that when he said that, that he had to think about it. And that he had to go back to his old role and pass it through his team, his business people, and they'd come back to us. But that's fine. In fact, that type of communication works for us." (Developer, Sparkasse Team 1)

The CR's decision-making process about prioritizing and reprioritizing requirements involves weighing alternatives and requires that CRs have a good understanding of the possibilities that the agile ISD method provides—

that is, to make changes throughout the project. CRs also need to understand what they can expect from the ISD team in a single iteration.

"I think I have a good understanding of what's possible from them [the ISD team], so I don't have unrealistic expectations. We are very good at talking about what the drivers are and how we make the decision about what's important. So that helps my decision-making process as well." (CR, Sparkasse Team 2).

Managing Quality. Within an agile ISD project, assessing and approving the quality of the software is traditionally a customer responsibility, which is achieved through constant and frequent feedback loops. There are two types of feedback loops: planned acceptance testing and ad-hoc

commenting.²⁴ Acceptance testing is a formal agile development practice where the CR tests the software to make sure that the requirements are included and have been implemented according to customer specifications. Interviewees described acceptance testing as a straightforward activity that involved a *“lot of testing, signing off the cards and approving them for deployment.”* (CR, Sparkasse Team 2) However, when defects or errors are identified, the quality management activity requires the CR to enforce quality standards, to reason with the ISD team and insist on immediate corrective action. The rationale for this behavior was explained as follows:

“The implication appears to be that if it’s a change, it has to get reprioritized, if it’s a bug it gets fixed, because that card is already prioritized. So that’s why we always try and say, no, it’s not a change.” (CR, Sparkasse Team 2)

In addition to planned acceptance testing, CRs also provide impromptu feedback during an agile development iteration. Agile practices such as daily stand-ups, co-location and wandering through the rows of paired programmers (where two programmers work together at the workstation) provide opportunities for such ad-hoc interactions. CRs found the ad-hoc feedback loop beneficial because:

- It represents a chance to control and influence the development process on an ongoing basis to ensure adherence to development goals
- It does not require the CR to wait for the scheduled feedback opportunity of acceptance testing to evaluate the software
- The exchanged knowledge (via ad-hoc comments) is advanced compared to the information in the original user story card and, therefore, educates CRs on alternative, and potentially better, ways to implement a requirement.

Interview data from developers showed that they too appreciate the spontaneous feedback and the related pre-evaluation of their work

²⁴ It is important to note that acceptance testing focuses on how well the software meets the requirements set out in the story cards. This is separate from unit testing, which is focused on ensuring the proper functioning of the software code (e.g., making sure data inputs are processed correctly, the application does not crash and the output is accurate).

because errors are not officially recorded and mistakes are instantly fixed. This minimizes delays for the ongoing iteration and, when feedback is supportive, instills a sense of personal confidence. To provide these ad-hoc comments, good relationships between the CR and the ISD team are essential, as is the CR’s awareness about communicating the ad-hoc feedback in a nuanced and sensitive manner. Overly critical comments can inadvertently lead to adverse effects such as developers “shutting down” or ceasing to invite ad-hoc feedback.

Implicit CR Responsibilities

Liaising with Diverse Organizational Stakeholders. Liaising with stakeholders is a time-intensive activity for CRs, which requires them to have a broad and diverse network of organizational contacts to which they can turn. Our data suggests that successfully engaging with stakeholders requires the CR to be savvy in creating support for the project, obtaining consensus on key requirements and ensuring that nothing stands in the way of achieving the project goals. Interviewees explained that, although the CR represents one customer department, he or she also needs to consider requirements from other associated departments to guarantee, for example, regulatory compliance and software security.

“... as a CR, I should be able to liaise with multiple people. So there will be product teams, and security, fraud and legal—it’s my responsibility to make sure that everything goes into the project from the business ... ” (CR, Sparkasse Team 1)

While interacting with others, the CR is in a good position to remove any roadblocks that might impede project progress. Identifying roadblocks and how to resolve them requires close collaboration with the ISD team and other organizational contacts, but also flexibility on the part of the CR.

“... if they’re hitting any roadblocks that they think will be an issue, it’s working with the team to make sure that we get around that roadblock.” (CR, Werkstatt Team 1)

When liaising with organizational stakeholders, CRs also perform resource-related activities on behalf of the ISD team. Although

the team needs and appreciates the support of the CR for additional resources, neither the traditional ISD literature nor the agile ISD literature has paid much attention to this implicit CR responsibility. We found that CRs are actively involved in allocating resources to development iterations and are instrumental in facilitating additional resources when circumstances demand it. CR support for resource requests provides additional credibility for the request. To influence senior IT managers, the CR must have good relationships with them and must possess an active network because, without these, the CR has no access, and his or her opinion may not hold much sway.

"I'm very good friends of the CIO and IT program director, and we've had some pretty tough conversations together ... about resourcing, about agile and what's going on with the team. ... Thus, I would say ... I need a resource, we need to make this happen, so they [senior management] will juggle that and get me an extra tester for a couple of weeks to make it happen." (CR, Werkstatt Team 2)

Managing Trust with the ISD Team and the Wider Organization. The second implicit responsibility of CRs is to maintain trust with the ISD team and the wider business. Trust is important for maintaining cooperation and a continuing focus on working toward project goals. To achieve this, the CR performs activities of motivating (instilling confidence in the team's ability to deliver), empathizing (caring for the team's interests) and evangelizing (trumpeting the team's achievements).²⁵ It is essential that CRs convincingly communicate the trust they have in the team's ability to deliver. The close ties established through frequent interactions and co-location can make this possible. We found that the social bonds and the CR's empathy are crucial for facilitating project progress, especially when tasks are challenging, the team lacks an understanding of the commercial reasons for certain decisions and fatigue sets in.

25 In fact, Nelson notes that nothing affects productivity and quality in ISD projects more than the ISD team's motivation. Nelson, R. R. "IT Project Management: Infamous Failures, Classic Mistakes, and Best Practices," *MIS Quarterly Executive* (6:2), 2007, pp. 67-78.

"It's communicating back to them [the ISD team] the success story of why it was important to deliver on that day. I have to change their mindset to convince them that commercially we are going down the right path." (CR, Werkstatt Team 1)

In summary, CRs in agile ISD perform several activities (which were listed in Table 2) beyond those suggested in the academic literature and practitioner reports.²⁶ This means, in turn, that the explicit and implicit responsibilities of CRs are also much broader and more diverse than commonly assumed. Although these findings emphasize the importance of the CR role in agile ISD projects, they also allude to the many different competencies required of CRs to master these responsibilities.

CR Competency Model for Agile Development Projects

Process for Deriving CR Competencies

The CR activities identified above provided an understanding of what this role encompasses—the tasks, actions and responsibilities of CRs in agile ISD projects. This understanding enabled us to derive the CR competencies that would allow an assigned CR to effectively undertake the role and hence perform the activities expected by the agile ISD team and other stakeholders. Our data analysis suggests that CRs need a set of competencies for the different explicit and implicit activities. In deriving the competencies, we analyzed the interview data to seek out connections made by interviewees between a CR activity and the competency (e.g., ability, skill and knowledge) necessary for performing the activity. We found that these connections were made in three different ways:

1. An interviewee directly mentioned an ability, skill or competency as important for undertaking the CR role. For example, a tester from Werkstatt Team 2 stated: *"What actually we look for over there is more communication skills."* We therefore

26 For more information, see Sillitti, A., Ceschi, M., Russo, B. and Succi, G. "Managing Uncertainty in Requirements: A Survey in Documentation-driven and Agile Companies," *11th IEEE International Software Metrics Symposium (METRICS 2005)*, Como, Italy, September 19-22, 2005, pp. 10-15.

noted communication skills as important for CRs.

2. An interviewee described an activity and added an expectation of a CR ability, competency or skill that the CR would need to possess to perform that activity. For example, the CR from Sparkasse Team 1 stated that the team *"... had expressed [to the CR] that we need decisions and we need them quick..."* when requirements described on the story cards were ambiguous or did not contain sufficient detail. This implies that the CR needs *management* competency and *coordination* skill because he or she is expected to perform the activity of *clarifying a requirement*.
3. An interviewee described an activity and explained how (i.e., by which abilities, skills or knowledge) the CR was able to perform the activity. For example, a developer from Sparkasse Team 1 made a connection between the CR activity of *clarifying a requirement* and the CR competence of *problem solving* and the related skill of *analytical thinking* by stating: *"We would go to him [to the CR] with a requirement issue ... then he would take that, listen to our feedback and then he would say, okay, I need to take this away and double-crunch it and think about it. And we knew that when he said that, that he had to think about it."*

From this analysis, we derived a rich repertoire of abilities, skills and knowledge relating to CR activities. Through multiple rounds of discussions within the research team, the abilities, skills and knowledge were sorted and grouped by the two researchers in an effort to cluster similar ones together and to separate different ones. As a result, we arrived at a cohesive set of 10 CR competencies within three competency areas that include multiple skills and knowledge.

Overview of the Three CR Competency Areas

Our CR competency model for agile ISD projects has three competency areas: Business, Socio-Relational and Systems. The

10 CR competencies we identified reflect different abilities that are important to several CR activities.²⁷ CRs will need to use the competencies in concert because there is no singular link between an activity and a competency.

1. Business Competency Area. This competency area represents the business and management aspects of the CR competency model. It captures CR competencies that are relevant for representing the customer's environment and the managerial competencies to manage a project. This area contains three competencies that express the nature of the business and closely related business topics:

- *Domain competency:* The ability to understand the broad function of the business department, its performance metrics and the business processes supported
- *Resource mobilization competency:* The ability to access and allocate the resources necessary for the agile development project to progress
- *Management competency:* The ability to direct and administer the agile development process to create the software that meets business needs.

2. Socio-Relational Competency Area. This competency area represents the social and people aspects of the CR competency model. It emphasizes that the process of developing software for a customer is as much a social process as it is a technical one. The competencies included in this area are sometimes referred to as "soft" to capture their inherent socialness. The three competencies in this area highlight the importance of relationships in human interactions:

- *Relationship-building competency:* The ability of the CR to establish and maintain interpersonal relationships with ISD team members

²⁷ It is important to point out that we only focus on skills and knowledge, as these two components of a competency are overt characteristics that are actionable for a company when compared to attitudes and traits. We recognize that there is no clean one-to-one mapping of competencies to areas, and, subsequently, of skills and knowledge to competencies. We grouped the skills and knowledge under each competency because we believe this reflects those that are expected to be most relevant.

Table 3: Skills and Knowledge in the Three Competency Areas

Competency Area	Competency	Related Skills and Knowledge
Business	Domain	1. Functional expertise and business process knowledge
	Resource mobilization	2. Budget allocation and acquisition of resources
	Management	3. Decision making, coordination, monitoring and control
Socio-Relational	Relationship building	1. Interpersonal, communication, empathy
	Negotiation	2. Persuasion, perceptiveness, diplomacy
	Motivation	3. Motivational and inspirational
Systems	Development method	1. Iterative development, operations, systems
	Problem solving	2. Deductive/inductive reasoning, creative thinking, analytical thinking
	Evaluation	3. Attention to detail, fortitude, assessment
	Delivery strategy	4. Self-regulation and planning

- *Negotiation competency*: The ability to leverage relationships with the ISD team and with other stakeholders to achieve project-related ends while taking account of different stakeholder interests
- *Motivation competency*: The ability to boost and channel the ISD team's morale to overcome challenging project situations.

3. Systems Competency Area. The Systems competency area represents the systems and technology aspects of the CR competency model. The competencies included in this area capture the skills and knowledge needed to conceptualize and build the software, thereby solving technology-related problems that emerge during the process. The four competencies included in this area capture the CR's abilities regarding the agile development process but do not include technical aspects of constructing the software:

- *Development method competency*: The ability to understand the process by which agile methods transform requirements into a functioning software system

- *Problem-solving competency*: The ability to work with the ISD team and other stakeholders to identify and implement solutions to problems with the development process or software product
- *Evaluation competency*: The ability to understand and enforce core metrics for implemented requirements
- *Delivery strategy competency*: The ability to determine and set the amount and pace of feedback loops (acceptance tests).

The related skills and knowledge for each of the three competency areas are listed in Table 3. We now describe each area, competency and related skills and knowledge in more detail.

Business Competency Area

The Business competency area captures the skills and knowledge a CR should possess to assist the ISD team with the project and to assess the software product for the customer. The CR needs to know what the customer department wants implemented in the software to support business operations (domain competency). Competencies that relate to resource-mobilization activities and the general

management ability of the CR are also included in the Business competency area. As discussed below, these three competencies enable the CR to perform a variety of activities.

Domain Competency. The two main activities enabled by the domain competency are: 1) Managing requirements (identifying, clarifying and prioritizing requirements) and 2) Managing quality (acceptance testing and providing ad-hoc feedback). The domain competency thus reflects an understanding of the functions and processes of the customer department. It is the responsibility of the CR to manage the requirements, and this means the CR must have intimate knowledge of the core business processes, how they are inter-related (e.g., process sequencing, interdependence) and their function (e.g., value-adding processes, mission critical processes). Furthermore, the CRs need knowledge about his or her functional area, including what type and format of data is needed in the department, the department's position in the organizational value chain, which other departments depend on and consume the outputs produced, and the reporting structures and strategic objectives. Equipped with this knowledge, the CR can identify, clarify and prioritize the requirements for the team. In addition, it enables the CR to provide ad-hoc feedback; the CR need refer only the most difficult issues back to his or her business department.

Resource Mobilization Competency. The main activity enabled by the resource mobilization competency is liaising with diverse organizational stakeholders (acquiring and allocating resources). This competency involves accessing and disbursing the resources necessary to support the agile ISD project. The iterative nature of agile ISD requires conscientious budget allocation to ensure sufficient resources are available for current as well as future iterations. Hence, when CRs perform their resource-allocation activities, they need to have knowledge about what resources are available for the project (i.e., funds, personnel, equipment) and how best to allocate them to the tasks for the current development cycle. Additionally, because agile software development is open to changes in requirements, the demand for resources will fluctuate. The CR

therefore needs the skills to marshal additional resources, either by supporting the ISD team in its requests for extra resources or by carrying out this activity on his or her own.

Management Competency. The four main activities underpinned by the management competency are: 1) Managing requirements, 2) Managing quality, 3) Liaising with diverse organizational stakeholders (coordinating tasks and people so that roadblocks for the ISD team are overcome) and 4) Managing trust with the ISD team and the wider organization (obtaining project support). This competency requires the CR to have a broad set of skills and knowledge to enable him or her to direct and administer the agile development process (decision making, coordination, monitoring and control). Although the skills and knowledge related to this competency are general in nature, they are crucial if an agile ISD project is to achieve its goals. Given the rapid pace at which development occurs and the need to balance the interests of various stakeholders, decision-making and coordination skills are necessary. Monitoring and control skills are important to ensure that development efforts remain aligned with project objectives. Organic approaches to development, such as agile ISD, are prone to veering off-course if not carefully monitored. Thus, to effectively master the responsibilities associated with the assessment of project deliverables, the CR must be capable of determining when requirements have not been implemented as agreed and subsequently take actions to rectify the issues.

Socio-Relational Competency Area

The Socio-Relational competency area includes three competencies and their related skills and knowledge. Agile ISD is positioned as a relational process, and emotions can run high when the pressure to deliver is on. Indeed, a core tenet of agile development is an emphasis on people and interactions over processes and documentation. Problems with flagging morale, frustration and counter-productive motives can emerge and have adverse effects on project progress. Failing to be attuned to relational issues can easily derail a project. These competencies in the Socio-Relational area enable the CR to perform the activities below.

Relationship-Building Competency. The three main activities enabled by the relationship-building competency are: 1) Managing quality (providing ad-hoc feedback), 2) Liaising with diverse organizational stakeholders (removing roadblocks and obtaining project support) and 3) Managing trust with the ISD team and the wider organization (motivating, empathizing and evangelizing). This competency involves establishing and maintaining interpersonal relationships with agile ISD team members and colleagues in the business department and the wider organization. Building relationships enhances the collaboration experience in agile ISD because team members are more willing to share their ideas and build on each other's comments and actions.²⁸ Empathy (e.g., caring about team members who work long hours) and close relationships build trust between the ISD team and the CR. This is important since the CR is the main interface between the ISD team and the customer department. Being skilled in this area also enables the CR to fulfil the implicit responsibility of stakeholder liaison where he or she needs to rely on strong, close relationships to be able to remove roadblocks and obtain additional project resources.

We have included communication under the relationship-building competency even though it is also a crucial skill for CRs in almost all of their activities. CRs need to be able to communicate well when managing requirements and quality. Communication skills are also necessary to engage and create trust among everyone of importance to the ISD project.²⁹

Negotiation Competency. The negotiation competency underpins three main activities: 1) Managing requirements (prioritizing requirements) 2) Managing quality (acceptance testing) and 3) Liaising with

diverse organizational stakeholders (removing roadblocks and obtaining project support). This competency provides CRs with the ability to leverage established relationships with the ISD team and other stakeholders to achieve project-related ends.

In any given organization, there are often multiple interests that divert resources and attention from an agile development project. Hence, CRs need to be able to discern and support these varying interests, especially as they may be convergent in some respects and divergent in others. Consequently, skills that contribute to an active use of the CR's network are highly desirable, as they will facilitate the CR activities of liaising with stakeholders and developing trust.

The negotiation competency also enables CRs to exert influence on ISD team members and to understand how to get support from other stakeholders for the project by tapping into the CR's existing social network. For example, during acceptance testing activities, the CR needs to negotiate with, and persuade, the ISD team about not moving the implementation of a requirement to a subsequent development iteration.

Important skills underlying the negotiation competency include the perceptiveness to sense the demands of various stakeholders, the ability to persuade to convince, and the diplomacy to balance motives and interests. CRs also need these skills when interacting with CIOs or departmental managers about additional resources and when acting as an evangelist for the ISD team and its achievements to attract attention and support (e.g., additional project resources) from more distant stakeholders. Without negotiation competency, CRs would be less capable of performing certain activities comprehensively (e.g., prioritizing, acceptance testing and resource allocation).

Motivation Competency. The motivation competency underpins two main activities: 1) Liaising with diverse organizational stakeholders to overcome project impediments and 2) Managing trust with the ISD team and the wider organization (motivating and empathizing). A CR's motivation competency is important because it enables the CR to boost and channel the agile ISD team's morale in challenging situations.

28 A laboratory study on digitally enabled teams found that, when strong team relationships have been established, improved idea exchange and integration patterns emerged. See Robert, L. P., Dennis, A. R. and Ahuja, M. K. "Social Capital and Knowledge Integration in Digitally Enabled Teams," *Information Systems Research* (19:3), 2008, pp. 314-334.

29 Our decision to include communication skills in the Socio-Relational competency area is consistent with the literature on human behavior and interpersonal communication that considers this skill as inherently human and tightly linked to the individual. For further reading on this topic, see Watzlawick, P., Bavelas, J. B., Jackson, D. D. and O'Hanlon, B. *Pragmatics of Human Communication: A Study of Interactional Patterns, Pathologies, and Paradoxes*, 1967, W. W. Norton and Company.

Based on our data, an implicit responsibility of CRs is to motivate ISD team members to continue with their development efforts in situations when they doubt the possibility of succeeding or question the rationale for continuing. During these challenging moments, team morale can be tested, creating the need for a boost. A competent CR is capable of being motivational when necessary and of compromising when the situation demands it. Being able to inspire people might be seen as a higher level of motivational skill, but it is a skill we believe is important for CRs in agile development projects because of the nature of such projects. The high receptiveness to change, evolving requirements and the evolutionary delivery schedule of agile projects create an environment of uncertainty, making it easy for the agile ISD team to lose focus, get side-tracked and give up. A CR who can instill enthusiasm and inspire the ISD team to believe in its strengths and abilities is important for achieving project outcomes.

Systems Competency Area

Depending on the agile development approach chosen, CRs are partially or fully assigned to an ISD team. With a full-time assignment, CRs are completely embedded in a work environment that is, at first, unfamiliar to them. Thus, CRs with knowledge and skills of the development method would be better prepared for the role. Once the agile ISD project is underway, and the CR is comfortable with the development domain, more development-focused competencies are needed. These competencies include problem solving, evaluation and the delivery strategy competency. They support the CR in performing the activities discussed below.

Development Method Competency. The development method competency underpins two main activities: 1) Managing requirements (identifying, clarifying and prioritizing requirements) and 2) Managing quality (acceptance testing and providing ad-hoc feedback). This competency reflects the need for CRs to have an understanding of the process by which agile development methods transform requirements into a functioning system. It also includes knowledge about concepts, such as the

evolutionary nature of the development method, where not all requirements are identified upfront, and recognizing that changes are possible and welcomed. For activities relating to the CR's explicit responsibilities, knowledge of the development method prepares the CR for his or her role and also provides understanding of issues such as why the team needs rapid feedback before it can proceed.

In addition, CRs need knowledge about system operations and the system in general to appreciate how the developed software integrates with the organization's larger IT landscape. These considerations are important for CRs when performing testing and also when providing ad-hoc feedback and prioritizing requirements. For example, a lack of awareness about dependencies between features can lead to poor decisions about the order in which inter-related features are implemented.

Problem-Solving Competency. The three main activities underpinned by the problem-solving competency are: 1) Managing requirements (clarifying and prioritizing requirements), 2) Managing quality (providing ad-hoc feedback) and 3) Liaising with diverse organizational stakeholders (removing roadblocks and acquiring additional project resources). This is an important CR competency, as it encapsulates the ability to work with the ISD team and other stakeholders to identify and implement solutions to problems with the development process or software product.

Although research and practice show that the dynamic nature of agile ISD is a major benefit, unanticipated problems inevitably arise from it. Resolving these problems as they arise and estimating the downstream implications requires CRs to have deductive and inductive reasoning skills, as well as the skills for creative and analytical thinking. These skills are especially important for CR activities that cannot be rehearsed ahead of time, such as providing ad-hoc feedback or clarifying a requirement on the spot. Creative thinking and coming up with unconventional solutions has proven to be helpful when the CR is trying to remove roadblocks for the team to ensure barrier-free development.

Evaluation Competency. The evaluation competency underpins the activity of managing

quality (acceptance testing and providing ad-hoc feedback). It reflects the ability to understand and enforce core metrics for implemented requirements. This competency is important when CRs manage quality and, thus, perform activities such as acceptance testing and approval of implemented functions. Indeed, the iterative and fast-paced nature of agile ISD demands that CRs be able to regularly verify whether implemented functions pass acceptance tests and do so in a timely manner. Failure to do so can result in delays for the entire project as the story card gets put on hold, needs to be reprioritized and potentially moved into a future iteration.

Important skills that enable CRs to competently undertake evaluation include attention to detail and general knowledge about how to perform an evaluation. CRs also need to have fortitude when evaluating the outcome of software development, so they can enforce acceptance standards. This skill is also important for the negotiation competency (part of the Socio-Relational competency area) because CRs may develop workplace friendships due to the close working environment with the ISD team (i.e., co-location). These friendships may impair the CR's willingness to insist on adherence to acceptance standards, causing the CR to accept a mediocre solution. Hence, the CR must first and foremost have fortitude when negotiating.

Delivery Strategy Competency. This competency underpins three main activities: 1) Managing requirements (clarifying and prioritizing requirements), 2) Managing quality (acceptance testing and providing ad-hoc feedback) and 3) Liaising with diverse organizational stakeholders about the benefits of the project (removing roadblocks and acquiring or allocating resources). It also provides the ability to set the amount and pace of feedback loops. As our data illustrates, CRs receive numerous requests to prioritize story cards, perform acceptance tests and sign off on completed cards. In addition, CRs are expected to provide ad-hoc feedback to a multitude of people (e.g. developers, testers, business analysts) so as not to impede development progress in the time frame established. To add to the demands, CRs are also asked to interact with various

stakeholders throughout the organization for the benefit of the project.

Taken together, these demands mean that CRs are expected to perform numerous activities that may overwhelm and “paralyze” an unprepared CR. CRs thus need planning skills so they can be more deliberate about when and how they can fulfill the various responsibilities that are essential for the successful completion of a project. Competent CRs draw upon self-regulation skills when establishing a rhythm for performing acceptance tests and signing off on story cards. Self-regulation skills enable them to better decide the amount of work they can accept so that each activity is still given its due attention.

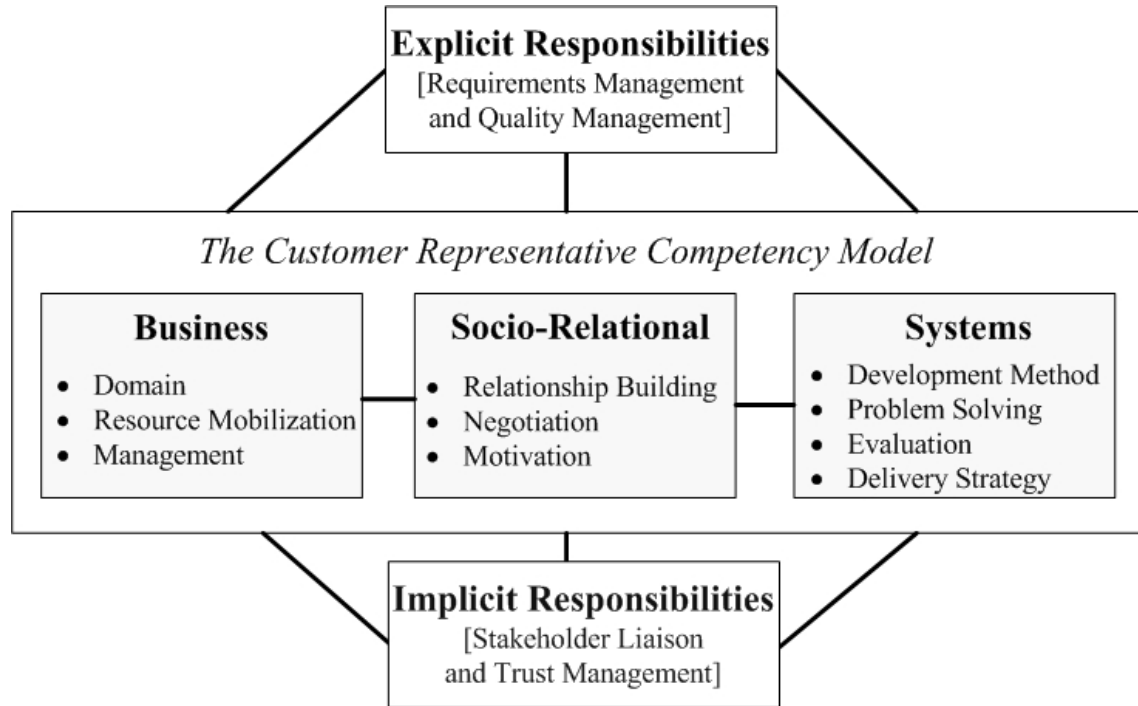
The CR Competency Model in Summary

In this study, we have developed a competency model for CRs in agile ISD projects. This model includes the competencies necessary to effectively perform the activities associated with explicit and implicit CR responsibilities, as identified and elaborated in our interviews. As the competency model in Figure 2 illustrates, the competencies are grouped into three areas that represent different aspects of the CR role—Business, Socio-Relational and Systems.

To adequately meet the demands of the explicit and implicit responsibilities in agile ISD, the three competency areas need to be integrated into the CR role. No area or competency dominates, but CRs cannot be effective in their role if they lack one of the competency areas. However, within one area, it might be possible to balance gaps in a competency with strengths in another competency. Undoubtedly, CRs will need to draw on different sets of skills and knowledge, depending on the activity they are performing at any point in time during the project. Thus, CRs cannot possess only some of the skills and knowledge and expect to effectively perform the role. Fortunately, some of these competencies, particularly those relating to the Systems competency area, can be developed and honed through experiential learning (i.e., learning by doing) in an agile ISD project.³⁰ This

30 See Chakraborty, S., Sarker, S. and Sarker, S., 2010, op. cit., which shows that project-specific knowledge can be developed by user representatives during the course of a project.

Figure 2: CR Competency Model in Agile Software Development Projects



form of competency development is intrinsically motivated and not based on institutional training programs. CRs can learn project-specific skills and knowledge that can be integrated with their existing skillset. For example, specific techniques for estimating and planning may be used by the ISD team for managing requirements. If the CR lacks such knowledge, he or she can learn through observation or active participation in the estimating and planning process. The agile ISD team can actively support the learning process a CR goes through by, for example, teaching the CR about the missing competencies at the beginning of the project. The competence gained from this first-hand experience can subsequently be leveraged as the CR fully participates in these activities.

Recommendations for CIOs on How to Use the CR Competency Model

The CR competency model provides a roadmap for organizations on how to effectively manage this unique role. CIOs can use the model as a tool when interacting with different

constituents (e.g., business managers, the larger organization and CRs) to improve the agile development process.

1. Use the Competency Model as a Communication Tool

The competency model can be used by CIOs to communicate the knowledge and skills expected of someone in the CR role. The three competency areas and their associated competencies reduce ambiguity about the abilities and expertise that the CR needs to possess. The competency model can also be used as an aid to departmental managers as they go about selecting potential candidates for the CR role. As no descriptions of the competencies required for the CR position have previously been published, CIOs can use the competency model to explicitly and comprehensively communicate the desired competencies to departmental managers as they begin the search.

Using the competency model as a communication tool enables CIOs to highlight an important message to departmental managers: *Do not pick the most dispensable*

person; rather, pick the most competent person. It is understandable that departmental managers want to keep their “best” people in their designated work roles. After all, what manager wants to lose his most productive asset to an ISD project whose benefits have not yet been seen? A natural tendency is therefore to assign an employee whose absence would have the least impact on the day-to-day functioning of the business department. However, as the CR competency model indicates, business-domain knowledge is an important part of the value that a CR brings to agile ISD projects. Our study suggests that assigning the most competent employee to the CR role is a short-term sacrifice for the customer department that will yield long-term benefits in the form of a functioning system that accurately meets the department’s needs. Assigning a less competent employee can cause long-term problems, such as mis-implementation of requirements, system release delays and increased development costs (e.g., due to re-work)—outcomes that have all been shown to be disruptive to the functioning of the customer department.³¹

2. Use the Competency Model as an Education and Training Tool

The competency model can be leveraged to identify training needs and create training programs that prepare and educate CRs for their role. Formal education and job tenure provide employees with knowledge and skills in their respective business fields. Depending on their personality, some CRs may already possess Socio-Relational competencies. However, it is unlikely that someone working in a business department will possess the skills and knowledge necessary to support agile ISD projects, such as a working knowledge of the agile method or duties related to software testing. Thus, the competency model can serve as a preliminary checklist to determine training needs for the assigned CR. Indeed, it would be desirable for CIOs to develop a pool of potential “agile-ready” CR candidates from which to draw when agile ISD projects are conceived. With such a pool in place, a situation in which employees have to learn “on the fly” what the CR

role encompasses—an experience that can have disastrous consequences for the CR and the agile ISD project team—would be avoided.

On a broader scale, the CIO can use the competency model as the basis for an enterprise-wide training program on how to become an effective CR within an agile ISD project. Thus, the three competency areas can serve both as a blueprint for the development of program content and materials, and as the basis for creating an integrated learning plan with other training programs. By adopting a more general approach to training programs, the broader workforce in the company would improve its skillset and knowledge. Regardless of whether participants in such programs are ever assigned to the CR role, this organizational learning and education would equip them with the Socio-Relational competency area skills such as negotiation, communication and interpersonal skills, which are also important for other organizational positions.

Training and education based on the CR competency model will not only better prepare employees to assume the CR role, it will also provide them with greater competence for their organizational roles. They will therefore be in a better position to add value in ways that benefit the organization, the customer department (e.g., getting the most critical system functions developed early and facilitating greater responsiveness of the ISD team to the customer department’s needs) and the ISD team.

In creating the training program for CRs, it is tempting to assume they need technical knowledge to be able to add real value to the agile ISD project. But as our competency model suggests, this assumption is invalid. Potentially, a CR with technical knowledge can get bogged down in solving technical problems instead of focusing on the business aspects of the development process. Other roles within the ISD team (e.g., developer and analyst) should concentrate on the technical aspects of implementing business requirements. The CR is primarily tasked with fulfilling the explicit and implicit responsibilities, which requires only a broad understanding of the agile development process, not detailed technical knowledge. The CR primarily requires a general understanding

31 See Nelson, R. R., op. cit., 2007; and Hoda, R., Noble, J. and Marshall, S., op. cit., 2011.

of the process by which requirements are transformed into system functions.

3. Use the Competency Model as a Tool to Change the Organizational Culture

Even though agile ISD has proliferated into the mainstream, most managers and employees in business departments know little about it beyond the “agile” label. Indeed, agile development may even have the reputation of “cowboy programming”—which managers fear because it suggests a lack of planning and control. CIOs can use the CR competency model to demonstrate that agile ISD is not an unstructured free-for-all approach to developing software, but instead requires a comprehensive set of competencies to undertake and complete the project. In fact, empirical academic studies and anecdotal evidence show that business managers, and those who work for them, who have experienced an agile ISD project are quick to sing the praises of agile development. The CR competency model can help to build a culture of support for an agile method beforehand and thus lower the hurdles that CIOs need to clear to get buy-in (e.g., budget, developer resources, a competent CR) for the next agile ISD project from business departments and the broader organization.

In contrast to traditional ISD, agile approaches view the business domain and system development as an integrated whole. But a majority of organizational cultures rarely see things this way. Rather, business functions and IT departments tend to be seen as distinct and separate entities that engage in arms’-length transactions. Indeed, as mentioned earlier, a core tenet of agile ISD is an emphasis on people and interactions over processes and documentation. Problems with flagging morale, frustration and counter-productive motives emerge and can have adverse effects on project progress. Failing to be attuned to relational issues can easily derail a project.

Thus, the CR competency model identifies what organizations can do to move closer to a more integrated view. Ensuring that more employees have the CR competencies can be a useful tool for changing the organizational culture and, consequently, how business

functional areas relate to IT departments in a way that benefits both parties.

4. Use the Competency Model as a Performance-Assessment Tool

For traditional job roles, HR departments use competency models for assessing role performance in a structured and coherent manner through the creation of standardized criteria. CIOs can leverage the competency model as a mechanism for assessing how well CRs are performing their role responsibilities. Specifically, the competencies identified in the model can serve as a basis for defining specific metrics by which CRs can be assessed. For each activity, a specific level of proficiency (novice, intermediary, expert) should be defined and the CR’s actual activities should be assessed against these levels.³² At the discretion of departmental or IT management, it may even be possible to give rewards and bonuses for the level of proficiency the CR reaches for each of the competencies. Giving rewards to CRs for superior performance in agile ISD projects allows CIOs to use the competency model not only as an assessment tool, but also as a motivational device to obtain the CR’s commitment to the project and its goals.

5. Use the Competency Model as a Diagnostic Tool

Finally, CIOs can use the CR competency model during and after an agile ISD project to determine the extent to which an employee assigned as the CR is leveraging the necessary competencies to facilitate project success. In this way, CIOs can employ the CR competency model as a diagnostic tool to determine where adjustments need to be made for the CR to better serve the needs of the agile ISD project. Empirical studies suggest that fulfilling the role of CR places significant demands on an employee’s time and that departmental managers often underestimate the time commitment involved in performing this role

32 For more details on best practice in HR for translating competency models into an assessment tool, see Stevens, G. “A Critical Review on the Science and Practice of Competency Modeling,” *Human Resource Development Review* (12:1), 2013, pp. 86-107.

effectively.³³ Being mindful of these demands, CIOs, together with CRs, can use the competency model to diagnose the stresses and activities that place intensive time demands on the CR. Overloading the CR may result in withdrawal behaviors (e.g., burnout, stress, tardiness).

Using the competency model as a diagnostic tool may well result in the model being revised to incorporate experiences from ongoing agile development practice in the organization. Competency models are not static frameworks. They are organic, and they should be refined regularly in collaboration with different stakeholders (e.g., CR, ISD team, business department). For example, it might be necessary to add additional competencies to the model as the agile method evolves—for example, when the method changes by adopting practices from Lean or DevOps methods.³⁴

Concluding Comments

The customer representative (CR) participates in agile ISD projects by carrying out explicit and implicit responsibilities that contribute toward the creation of systems that meet evolving customer needs. When performed effectively, the CR role can enable agile ISD teams to rapidly produce the desired functionality.

Competency libraries such as O*Net provide descriptions of competencies for software project roles (e.g., developer, project manager, systems analyst) but up until now, a competency model for an effective CR has not existed. Given the need for a clear delineation of the essential competencies necessary to perform the CR role, this article has developed a competency model for CRs in agile ISD projects. The competency model is derived from the activities performed by CRs and is partitioned into three competency

areas: Business, Socio-Relational and Systems. This model provides a versatile tool for CIOs and business managers to recruit, evaluate and support suitable employees for the CR role in agile ISD projects.

Appendix: Research Method

Our research was performed in Australian companies that developed software using an agile method. As part of our study, we interviewed four agile software teams and related managerial roles (e.g., program managers, executive managers) in two companies to explore the role of the customer representative (CR). These two companies were early adopters of agile methods in Australia and New Zealand. One is a large financial service provider that maintains its own agile educational facility to teach and tailor its XP and Scrum-based approach. It is listed on the Australian Stock Exchange. The other is also listed on the Australian Stock Exchange and is an online provider and the industry market leader for online accommodation and travel. Since the company's foundation in 2000, an agile in-house method based on XP and Crystal has been used.

In each company, software development took place for an in-house customer that had assigned a full-time resource (the CR) from its business unit to be placed with the development teams for the duration of the project. To respect the companies' wishes for anonymity when publishing the results, we use two aliases: Sparkasse for the financial service company and Werkstatt for the online accommodation provider.

Over a period of four months in 2010, we conducted 31 interviews with developers, testers, business analysts, project managers, CRs and other members of the respective organizations. These interviews were our main data source for this research. Face-to-face interviews were conducted by two researchers. During the interviews, the researchers took notes to allow for follow-up questions, and also to ensure a common understanding among the researchers. Interviews were recorded and subsequently transcribed.

³³ See Martin, A., Biddle, R. and Noble, J., op. cit., 2004. One result of these case studies is the insight that the CR has a stressful, high-pressure role that may not be sustainable over long periods of time.

³⁴ Lean development focuses on the production of software in the most efficient manner through the use of statistical-based metrics, ratios and indices; see Schmidt, J. and Lyle, D. *Lean Integration: An Integration Factory Approach to Business Agility*, 2010, Addison-Wesley.

DevOps blends software development and operations into a cohesive whole intended to improve collaboration between the two initially separate fields; see Hüttermann, M. *DevOps for Developers*, 2010, Springer.

When analyzing the data, we followed standard academic procedures³⁵ to ensure the results were dependable (findings are stable and consistent and can be repeated), credible (findings make sense and can be verified) and transferable (findings have broader implications and can be transferred to another context). We therefore implemented various procedures, such as extensive engagement with the teams, checking the plausibility of preliminary findings with study participants during multiple site visits six months later and creating clear audit trails to demonstrate how the data was collected.

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³⁵ See, for example, Lincoln, Y. S. and Guba, E. G. *Naturalistic Inquiry*, 1985, SAGE Publications; and Miles, M. B. and Huberman, A. M. *Qualitative Data Analysis*, 1994, SAGE Publications.

