A case study of how reshoring affects the quality of software development

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ABSTRACT
The purpose of this research is to provide more insights into the consequences of reshoring on the performance of software development. A thorough understanding of the consequences of reshoring has been attained by interviewing the stakeholders of a recently reshored software development department. This research embraced a multimethod qualitative approach.
The insights gained from the case indicates that software performance has been affected by reshoring. Due to reshoring, the software developers of the department are sitting next or close to each other. This results in less communication complexity, more collaboration among developers and better understanding of the end-product. These consequences did lead to a higher software quality performance (SQP). Other than that, reshoring also came along with some managerial implication, such as hiring new developers. But there is no causal relationship between reshoring and software quality performance. However, the consequences of reshoring do lead to a higher SQP.

Keywords
Software quality, software development quality, reshoring, reverse offshoring, reshoring software development

INTRODUCTION
The 13-hours time difference with the east coast countries comes naturally with potential competitive opportunities. By hiring software developers on the east coast, a company may embrace "non-stop development". This might sound very ideal, but moving your software development activities abroad comes with challenges. Moving your business activities abroad is known as offshoring. The expected benefits of offshoring were cutting the costs due to the lower wages; having access to a larger labor pool; entering new markets and therefore increasing international opportunities; increasing the quality of the service; and reducing the time-to-market by having continuous production (Aspray et al., 2006; Bhalla, Sodhi & Son, 2008; Carmel & Agarwal, 2001; Foerstl, Kirchoff & Bals, 2016; Krishna, Sahay & Walsham, 2004; Ravichandran & Ahmed, 1993). However, at present, we observe a reverse trend; reshoring. Managers are migrating their previously offshored business activities back into the organization of origin (Newbery, 2019). Reshoring of business services is a result of disintegration advantages, performance shortcomings, accessing new markets and cost-saving (Albertoni et al., 2017; CBS, n.d.). The last three factors are similar to the original offshoring strategy.

Problem statement
This research will contribute to the understanding of the reshoring phenomenon, which can provide insight into both research and practice. As with any new topic, the literature on reshoring is still very fragmented. Little is known about the outcomes of reshoring, the premise is that the software quality performance should increase due to reshoring. But the extent to which it will increase and what is leading this potential increase, are unknown. This research will also contribute to the practical understanding of moving software development abroad. By taking into account what the effect of reshoring has been on the performance of the software development
One of the main reasons for reshoring is performance shortcomings. Within the IT sector, the software industry is most often offshored (Ambrose & Chiravuri, 2010). One performance measurement for software development is software quality performance (SQP). Software quality performance can be defined as: " the degree to which the objectives of software product quality and software development process efficiency (also referred to as software development process quality) are met by the systems development organization" (Ravichandran & Rai, 2000, p. 242). In other words, software quality performance consists of two major components: software development process efficiency and software product quality (Ambrose & Chiravuri, 2010). This will be the definition this research will take as leading, see Figure 1 for graphical overview.

Figure 1: Definition of software quality performance

Software quality performance is incorporating the efficiency of the software development process as well as software product quality. The benefit of this metric is that it will take the whole software development cycle into consideration. Therefore the research question for this report is: *How is reshoring affecting the software quality performance?*

RESEARCH
The purpose of this research is to discover what has happened due to reshoring and gain insight into the situation, resulting in an exploratory study. Since it is not yet known how reshoring will affect software development, an inductive research approach will be applied. A case study will be used to answer the research question. The aim of the case study is to describe a phenomenon in a real-life context (Saunders et al., 2016). The time horizon of this research will be a cross-sectional study. This case study will be based on interviews and taken over a short period of time.
To answer the research question a case study will be conducted at a software department of an internationally operating bank within the Netherlands, which recently

reshored its teams. The employees in the department have either worked offshore or have worked with colleagues who were working offshore. By interviewing all the stakeholders of the department, including developers, scrum masters, product owners, and managers, a thorough understanding of the consequences of reshoring will be attained.

Data collection

This study is based on an embedded approach. The data for this research has been collected from both primary and secondary sources. The primary sources are individual and focus group interviews. To get a better understanding of the culture and way of working within the department, I have combined the research with an internship.

The secondary sources consist of an interview transcript of a fellow intern and documents received from the scrum masters of the department. The primary sources are used for the analysis; to answer the research question. The secondary sources are used to have a better understanding of the context of this research.

For this research, eight individual and three focus group interviews were conducted. This research started with an exploratory interview with the manager of the department to get a clear view of the reshoring process. Four out of the eight in-depth interviews were conducted with developers who used to work offshore and are now working onsite. The remaining four interviews were conducted with developers who have not worked offshore. And lastly, the architect of the department has also been interviewed. Besides the individual interviews, both the product owners and the scrum masters were interviewed through a focus group interview. They are part of the software development cycle and therefore their point of view is taken into account during this research. Other than that, one focus group interview was conducted with another team which did not get reshored and is still working with colleagues offshore.

Data analysis

The research question consisted of two major concepts: reshoring and software quality performance. Due to this, the interviews got coded twice: once for each concept.

The thematic analysis will be used to analyze the data from the interviews. The purpose of thematic analysis is to identify themes in the collected data that are related to the research question (Saunders et al., 2016, p. 579). The open coding method is applied during the analysis due to the inductive nature of the research. The interview transcripts are coded by using the Atlas.ti program. After coding the interviews, and having the first order codes, codes with a similar theme will be grouped. This will result in second-order concepts, which are summarizing the first-order concept.

RESULTS

Table 1 shows the first and second-order codes from the analysis. The codes in Table 1 do represent the consequences of reshoring. Figure 2 represents the concepts which were, according to the interviewees, important for developing software.

Table 1: List of important concepts regarding software performance

2nd order codes	1st order codes
Less communication complexity	Complicating communication
	Direct communication without communication layers
	Accessible and easy communication
	Efficient communication (less time spend)
Better collaboration	Personal connection with colleagues
	More interaction with fellow developers
	Easier and efficient to explain and understand
	Combining technical and functional knowledge
Better understanding	Better context understanding
	More interaction between the development team and business
	Faster incident management
Managerial implications	New teams
	Hiring new developers
	Transparency

Figure 2: List of important concepts regarding software performance

CONCLUSION

The research question of this paper was: how is reshoring affecting software quality performance? To answer this question we will be looking into the consequences of reshoring.

Answer to research question

First of all, reshoring ensured that all developers were at one place. Logically this eliminated the complexity of communication which the developers had to deal with previously. Besides this, the communication layers disappeared too. The employees were able to communicate directly with the person in regard. It became easier and more accessible for each developer to talk to others Since you can approach someone and there are fewer difficulties while communicating, reshoring has also increased the efficiency of communication. All this actually ensured that

you could communicate much more effectively. By communicating effectively, you can speed up the process.

Figure 3: Effect of reshoring on software quality performance through less communication complexity

If you are in the same location, you will automatically interact more with each other. This interaction ensures that you can build a personal relationship with your colleagues. And it also reinforces the ease of approaching someone, which has been appointed before. This together ensures that you start to understand each other much faster and easier. Additionally, it became easier to share knowledge between developers. Altogether, these consequences led to a higher level of collaboration. Reshoring made it possible to connect and interact with others, both with fellow developers and the business. Together with knowledge sharing, this ultimately led to better solutions.

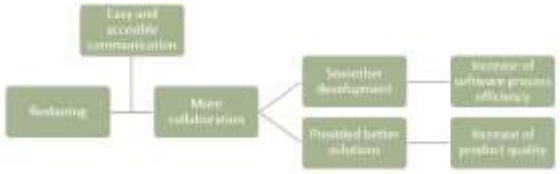

Figure 4: Effect of reshoring on software quality performance through more collaboration

If you start working onsite, you will get to know why certain things are happening. This will lead to a better understanding of the work activities and processes. By getting a better contextual understanding and interacting more with the business, better solutions can be provided. And since everyone is onsite, a developer will be able to solve a software issue faster. Therefore the agility of software development increases. Every developer has a better understanding and can easily approach someone to ask for help or ask questions to. Therefore a better understanding is guaranteed if there is good cooperation. By getting a better picture, a developer can also deliver better results. And therefore the functional quality of the software increases.

Figure 5: Effect of reshoring on software quality performance through more understanding

And lastly, the managerial implication. These implications did influence the software performance. But the implications do not have a direct connection with reshoring. E.g. reshoring does not necessarily mean that junior developers are hired.

ROLE OF THE STUDENT (MANDATORY)

During this research I was a business administration bachelor student, I conducted this research for my bachelor thesis. I combined my thesis research with an internship, this was my own choice. The topic of this research (reshoring) was proposed by myself. The research question was drawn up in consultation with the manager of the department. This consultation was purely focused on the feasibility (regarding the data collection) of the research. Designing the research, collecting the data, analyzing the data and the writing was done by myself. The supervisor helped me with narrowing down the research question and structuring my report.

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