R. Berntsson-Svensson, A. Aurum, C. Wohlin and G. Hu, "Successful Software Project and Products: An Empirical Investigation Comparing Australia and Sweden", Proceedings Australasian Conference on Information Systems, 2006.

Successful Software Project and Products: An Empirical Investigation Comparing Australia and Sweden

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Abstract

The success and failure of software projects have been discussed in literature for many years. Research findings do not agree with one another given different types of projects, products and cultures that have been investigated. This research examines different perceptions about what effect various factors have on software project success among different cultures, namely Australia and Sweden. Our findings indicate that there are differences of certain factors effect on software project success across various cultures. Furthermore, software developers from both countries agreed that "satisfied customer" is the most important factor for software product success.

Keywords

Product Success, Success factors, Successful project.

INTRODUCTION

There is often a difference between the planned and actual progress of a software project. Despite experiencing many successful software projects, software engineers still struggle to ensure the consistent success of their projects. Several researchers show that many software development projects end in failure (Glass 1998, Jones 1995, Lyytinen and Hirschheim 1987, van Genuchten 1991). However, the CHAOS report (Standish Group 2001) indicates that the success rate of software systems that meet business objectives within budget and schedule has increased. The report shows that in 1994, 31% of all software projects failed and only 16% were successful. Six years later, only 23% of all software projects failed while the success rate has increased to 28% (Standish Group 2001). While the CHAOS report presents an encouraging view, others have different measures of software project success rate. One study shows that as many as 80% of all software projects run over budget (Walkerden and Jeffery 1997), where the typical software projects exceed their budget by 50% (Gibbs 1994, Johnson 1995). On the other hand, a study by Berntsson-Svensson and Aurum (2006) indicates that the success rate is as high as 75% of all software projects.

Others argue that the measure of "successful software project" will vary depending on how you define it, for example, one definition is: completed within budget, on schedule, and meet business objectives (Standish Group 2001). Linberg (1999) found in his study that there are different opinions between software developers and managers when it comes to defining what constitutes a successful software project. Linberg's conclusion suggests that a new definition of success is needed. This definition needs to consider differences in opinions across different cultures regarding to success factors in software development.

In the context above, our literature review revealed two issues. Firstly, there are several studies in software engineering (SE) and information systems (IS) literature that investigates success factors. However, their findings do not always agree with one another given different types of projects, products and cultures that have been investigated (see Table 1). Secondly, many published success factors are not up to date and the level of details varies. Two possible reasons for this are (1) the data collection and analysis procedures used is questionable (Schmidt et al. 2001), and (2) all data is collected from a single culture, which may introduce bias in the findings.

The objective of this article is to explore project and product success factors in different countries, namely Australia and Sweden. Furthermore, it aims to compare the view of respondents' from these two countries as to the factors that lead to software project and product success. This article presents the results of an empirical study, based on data collected from 33 software projects and 15 companies in Australia and Sweden. The contribution of this article is two fold: (1) it provides a comparison of success factors for software projects and products between Australia and Sweden, and (2) it studies how practitioners in Australia and Sweden define success factors for software projects and products.

The reminder of this paper is organized as follows. First, related work will be introduced, followed by the research design and process. Third, we present the findings in this study and a discussion around the findings. Then there is a discussion of the validity of this research and finally conclusions are presented.

BACKGROUND

Both the SE and IS literature have dealt with successful projects and what factors lead to project success. What is a successful software project? This question is not easy to answer; there are different definitions of software project success in the literature depending on culture, type of industry, or type of project that the data was collected from (see Table 1). A classical definition of project success, as mentioned earlier, is one that is within budget and on time. In the software project management literature, the most common definition of project success is the one from Standish Group (2001), which defines software project success as meeting budget, delivery, and business objectives. Lewis (2001) defines project success as meeting performance requirements, cost requirements, time restrictions, and project scope. There are projects that meet all of these factors, but are not necessarily seen as successful. On the other hand, there are projects that do not meet above criteria, but are still seen as successful nonetheless (Lewis 2001).

Project Success versus Product Success

According to Baccarini (1999), project success requires a combination of *project management success* and *project product success*. Project management success is related to the efficiency of the project management process in terms of cost, time and quality. On the other hand, project product success is related to the effectiveness of the end product. Baccarini (1999) summarize project success as:

Project success = project management success + project product success

In addition, *product* success is not readily defined, although it is generally seen as being a product that satisfies user requirements. In the literature there is little information about software products and successful software product. Existing studies (Gobeli et al. 1998, Wallin et al. 2002) that examines software products usually discuss software projects, but not the software product development. Berntsson-Svensson and Aurum (2006) define successful software products for the consulting industry as meeting customer expectation, a working product, and economic benefits for the supplier.

Other researchers have also pointed out the causal relationship between project management success and project product success (Baccarini 1999, Van Der Westhuizen and Fitzgerald 2005). On the other hand, a project that is over budget can be seen as a failure, but the product can still be a success (Van Der Westhuizen and Fitzgerald 2005). A project that is within budget and on time may be seen as a successful project, but the end product may be a failure (Berntsson-Svensson 2006, Linberg 1999).

Identifying Project Success Factors

In order to obtain a better understanding of software project success factors, we examined project success factors across the SE and IS literature. The IS literature has nominated several specific candidate factors for successful software projects (Davis 1982, McFarlan 1981). Of all these factors, top management support appears to be the most consistent factor across studies (Keen and Scott-Morton 1978). Other factors that have been emphasized by the IS literature are: high-quality system design and developer-user interaction (Kwon and Zmud 1987). In the SE literature, several lists of factors for successful projects can be found. Boehm (1989, 1991) provides a typical list of factors while Barki et al. (1993) developed a list with factors from existing literature.

However, in terms of project and product success factors, both the SE and IS literature have addressed similar issues. Table 1 illustrates software project factors from various studies. The results from seven studies present different success factors. This may be due to the fact that the studies were conducted in different cultures (countries), in different industries or at different companies. Alternatively, the nature of the software project may play a role in the outcome of these studies.

Table 1: Literature success factors

Literature	Project size	Company type	Country	Success factors
Standish Group (2001)	NA	NA	USA	User involvement, executive support, experienced project manager, clear business objectives, minimized scope, firm basic requirements
Berntsson-Svensson and Aurum (2006)	61 people with project duration of 13 months	Telecommunication	Australia and Sweden	Complete and accurate requirements from project start, completing the requirements (if not complete from project start) during the project, enough time for requirements elicitation, use of specific method for requirements gathering
Milis and Mercken 2002	1 year with a budget over € 1.5 million	Banks and insurance	Belgium	Management involvement and support, Project definition, project team, project plan, change management, proper project resources
Schmidt et al. (2001)	28 person-month	NA	Finland	Top management commitment, effective project management skills, understanding the requirements, planning, required skills in the project personnel, managing change properly
Verner and Cerpa (2005)	NA	Insurance, banks, finance	Australia	Skilled project manager, good and complete requirements, good schedule and estimates, working long hours
Schmidt et al. (2001)	17 person-months	NA	Hong-Kong	User commitment, adequate user involvement, cooperation from users, top management commitment, effective project management skills clear objectives/scope
Verner and Evanco (2005)	NA	Banks, financial institutions, insurance	USA	Good project manager, good requirements, good project vision, project manager communication skills, working long hours

***NA**: Not available*

RESEARCH DESIGN

The primary objective of this study is to examine software project and product success factors. We identified the following research questions that contribute to our empirical investigation in Australian and Swedish companies.

RQ1 What is the effect of certain factors on the success or failure of projects in Australia and Sweden?
RQ2 How do various countries define project success and are there any differences across countries?
RQ3 How do various countries define product success and are there any differences across countries?

A quantitative questionnaire (Berntsson-Svensson 2006) was designed to evaluate the research questions. The questionnaire comprised of 33, mainly close-ended questions. Furthermore, weighted and open-ended questions were also included. Several pilot studies were conducted to validate the questionnaire. Before the research was conducted in Australia, ethical clearance was received from the University of New South Wales.

The questionnaire has three parts. The first part is aimed to gather background information about the subjects. This includes contact details, gender, academic background, experience in software development, current position, and information about their company. The second part contained close-ended questions and was answered using a six or three point scale. These questions addressed different factors about the subjects' last completed software projects. Open-ended questions were also used in the second part to allow subjects to answer questions using their own words and thoughts. The third part is about software products where the subjects were involved in the development. This part contained open-ended questions and one weighted question. The weighted question made it possible for us to determine the importance of each factor. Each subject was given 1000 points to assign to nine pre-defined factors (the subjects had the opportunity to add their own factors). The 1000 points can be assigned however the subjects wished (i.e. one factor could be assigned 1000 points); with the exception that two factors cannot be given the same amount of points (except for no points at all, two or more factors can be given no points).

Process

The population in this study was software practitioners from Australian and Swedish companies. Software practitioners are defined as software developers (including programmers), database developers, software testers, etc. According to (Babbie 2004), a good selection process from a large known population is the probability sampling method, which was used in this study. Samples were selected in two different ways: through known people at companies and randomly from a list with companies that develop software using systematic sampling

with random start (Babbie 2004). The participants (subjects) were selected by the contact person at each company. Two forms for data collection were used: emailed questionnaires and structured interviews. Emailed questionnaires were used to contact large sample sizes and for minimizing time for data collection and analysis. However, there are potential risks with emailed questionnaires, such as lack of interests and time, and a low response rate. Therefore, structured interviews were used to increase the quantity and the reliability of data collected (Babbie 2004).

To obtain an understanding of the collected data we use the phenomenology (Dahlberg et al. 2001) method. First we sorted the data into different sources and put the collected data onto paper. Then we start to divide the data into small piles of categories and put a name on each pile, descriptive of the content of the pile. We read each pile over until a deeper understanding was obtained.

RESULTS

The sample size of this study was relatively small; however, it was large enough to analyse to provide an understanding of the different definitions of project success between Australia and Sweden. The questionnaire was sent to 15 companies (seven in Australia and eight in Sweden) and 33 responses were received. This means some companies provided more than one response due to involvement in various projects. Thus, it was possible to treat the responses as independent of one another. The spread of the responses was: 16 from Australia and 17 from Sweden.

The subjects of this study have different commonalities in terms of their backgrounds. However, in both countries about 75% of the subjects were male and 25% were female. Almost 65% of the subjects from Australia had a bachelor degree and 63% were managers. However, about half of the subjects from Sweden had a master degree and 47% of them were managers. In addition, the average group for the Australians was 36-40 years while the average years the subjects had spent working at their current company was 12 years. Notably, for the Swedes the average age was 31-35 years and average years spent at current company was 6 years. Projects in Australia typically involved 25 people with project duration averaging 11 months. In Sweden a typically project involved 43 people with an average project duration of 13 months. Both countries had approximately 80% success rate for their software projects.

Software Project Success Factors

In analysing RQ1, we considered 15 factors related to project success and failure with close reference to the literature, see Table 2. Subjects were asked to consider each of the 15 factors and decide which factors that characterized the last completed project they participated in. Table 2 presents the number of successful and failed projects that were characterized by each factor, sorted by country. We found that factors had different effects on project success or failure depending on the country concerned. For example, in Sweden, 58% of all successful projects rewarded their staff, among failed projects; none of them rewarded their staff. Although this seems to be an interesting result, when we examined the result from Australia, the finding was not consistent with the Swedish result. In other words, although 30% of the successful projects rewarded their staff, for failed projects, the rewards was 67%. The following summarizes our findings:

Australia: In Australia, the factors that influenced most project success were:

- Complete and accurate requirements from project start
- Enough time for requirements elicitation
- Well-defined project scope
- Risk identification before project start

Good schedule estimation was a factor that 60% of all successful projects fulfilled in Australia. However, since 40% of failed projects also had good schedule estimations, it was not possible to state that having good schedule estimations was related to project success. The three factors that were related to project failure were:

- Changing the project manager
- Adding extra personnel to meet schedule estimates
- Rewarding staff for working long hours

None of the remaining eight factors (Table 2) did have any effect on project success or failure. Subjects were asked who did the project schedule estimation. However, due to too many variations and combinations of answers we received; it was not possible to find any patterns based on a) who was consistently responsible for estimation and b) a particular role consistently being responsible for project success or failure.

Sweden: As illustrated in Table 2, the following factors affected project success:

- Use of specific method for requirements gathering

- Rewarding staff for working long hours
- Complete and accurate requirements from project start
- Enough time for requirements elicitation
- Good schedule estimates

We were unable to identify which methods that were used for requirements gathering due to too many variations in the provided answers from subjects. We found that the only factor that played a major role in project failure was:

- Adding extra personnel to meet schedule estimates

It was not possible to relate, "project manager supported working long hours" to project failure because almost 70% of the successful projects supported working long hours. We found out that the remanning factors (see Table 2) had no effect on project success or failure for Sweden. More failed than successful projects had a well defined project scope. This was not inline with previous findings in the literature (Milis and Mercken 2002, Verner and Evanco 2005).

Table 2: Percentage of projects fulfilling each factor

Factor	**Australia**		**Sweden**	
	Successful	Failed	Successful	Failed
Project changed PM	38%	100%	57%	33%
PM supported long hours	62%	67%	69%	100%
Staff rewarded for long hours	30%	67%	58%	0%
Use of specific requirements method	100%	100%	86%	0%
Completed and accurate requirements form the start	46%	0%	8%	0%
- If not, completed during project	100%	100%	69%	50%
Enough allocated time for requirements elicitation	77%	0%	33%	0%
Project's scope well defined	85%	0%	54%	67%
Extra personnel added to met schedule timetable	42%	100%	38%	100%
Commitment and support from sponsor/project champion	92%	100%	75%	67%
Experience project manager	80%	100%	60%	80%
Project manager understood the customer's problem	80%	80%	60%	60%
Customer involved in the project	80%	80%	60%	40%
Risk identification before project start	80%	40%	50%	60%
Good schedule estimations	60%	40%	60%	20%

Contrasting Country Perceptions of Project Success

In analysing RQ2, we identified 18 factors that were related to project success from a detailed literature review. We asked subjects to select the three most and least important factors for project success. The findings from Australia and Sweden are presented in Table 3. From Table 3 we can see that Australia and Sweden agreed that "Complete and accurate requirements" was important for project success. This was the only agreement between the two countries, each country felt that different factors characterize successful project. A surprising finding is that not a single subject from any country thought that "good schedule" was an important factor for project success. This is an interesting finding since it differed from the result provided about the characteristics of their last completed project. That is, subjects from Sweden stated earlier that good schedule estimates were related to project success (see Table 2). Furthermore, subjects from Australia considered a "committed sponsor" as one of the three most important factors for project success, while subjects from Sweden considered this factor among the three least important ones. In addition, both subjects from Australia and Sweden considered good estimations as one of the three least important factors, which is surprising since "good estimates" is mentioned in the literature (Verner and Cerpa 2005) as an important factor for project success.

Subjects from Australia viewed "customer involvement" and a "committed sponsor" as the two most important factors for project success, which was not inline with the characteristics of their latest completed project (Table 2). Subjects from Sweden viewed "complete and accurate requirements" as a success factor. This result was inline with the characteristics of their latest completed project, allowing a positive relationship to be inferred between complete and accurate requirements and project success (Table 2).

Table 3: Software project success factors according to software practitioners

	Australia	Sweden
Three most important success factors	Customer involvement	Understanding customer's problem
	Committed sponsor	Good relation between personnel
	Complete and accurate requirements	Complete and accurate requirements
Three least important success factors	Good schedule	Good schedule
	Good estimates	Committed sponsor
	Experienced project manager	Good estimates

Table 4: Software product success factors according to software practitioners

	Australia	Sweden
Three most important success factors	Satisfied customer (20%)	Satisfied customer (30%)
	Great quality (14%)	Customer comes back (14%)
	Reliability (12%)	The product works (14%)
Three least important success factors	Many sold copies (5%)	Satisfied top management (1%)
	Economic benefit for the supplier (6%)	Many sold copies (2%)
	Customer comes back (9%)	Good reputation for the supplier (5%)

Software Product Success Factors

In analysing RQ3, from previous literature, 10 potential factors were identified. The subjects were asked to rank the importance of each factor for product success by assigning points. They were told no two factors could be assigned the same amount of points with one exception; two or more factors could have a zero value. Table 4 presents the three most and least important factors for product success and how many points (percentage of total points spent by each country) each factor received from the subjects.

The results show that subjects from both countries agreed that a "satisfied customer" was the most important factor for product success. This was the only agreement among important factors for product success between Australia and Sweden. Subjects from Sweden felt that a returning customer was one of the most important factors in determining product success, while subjects from Australia considered this factor as unimportant. Furthermore, both subjects from Australia and Sweden agreed "many sold copies" was one of the least important factor for product success.

DISCUSSION

In this study no statistical calculation to find significant connection between factors and project success or failure is conducted due to limitation of data points. All stated relations between factors and project success or failure were concluded with the use of deductive logic.

Effect on Certain Factors on the Success or Failure of Projects

There were both differences and similarities between Australia and Sweden when it came to perceptions of what effect certain factors had on project success and failure. There were two factors that both countries considered as important for project success: (1) complete and accurate requirements from project start and (2) having enough time for requirements elicitation. This result was not surprising, confirming what was stated in the literature (Standish Group 2001, Berntsson-Svensson and Aurum 2006, Schmidt et al. 2001). However, there is an interesting finding from the result, which is the difference between Australia and Sweden. Less than 10% of the successful Swedish projects and almost 50% of the Australian had complete and accurate requirements for project start. One explanation could be different understanding of what 'complete and accurate requirements' is or is it related to project type i.e. if data is collected from a multinational company, most of the requirements may have been identified at another site? Another possible explanation could be cultural differences. According to Singh et al. (2002) Australia has a higher "uncertainty avoidance" which leads to more laws and formal rules. This could reflect the result that the Australians are more afraid of uncertainty and therefore have more projects with complete and accurate requirements from project start. Alternatively it could be the fact that the Australian projects spent more time with requirements elicitation. However, it is surprising that none of the Swedish

successful projects that had enough time for requirements elicitation had complete and accurate requirements from project start.

Furthermore, not a single failed project from Australia or Sweden had complete and accurate requirements form project start. Since the importance of complete requirements is well known, why do projects start without complete requirements? One explanation could be that requirements elicitation is a continual process, for example, prototyping. One subject stated:

"*They can never be "completed"…there is always more…*"

Alternatively it could be time to market. It is important to release software at the right time, otherwise competitors may release first or the software may be too old. Another explanation could be lack of time for requirements elicitation; none of the failed project from Australia and Sweden had enough time for requirements elicitation. Why would a supplier start projects without enough time for requirements elicitation? Is it because of pressure from customer and stakeholders? Subjects from Sweden considered a good schedule as an important factor in project success, which is aligned with findings in the literature (Verner and Evanco 2005). However, subjects from Australia did not agree on this point. A well-defined project scope is stated in the literature (Standish Group 2001) as a success factor, but only subjects from Australia supported such finding. The Australian subjects see a well-defined project scope as an important success factor, which is inline with the literature (Standish Group 2001). However, the Swedish subjects did not support this. More failed than successful projects from Sweden had a well-defined project scope, which was surprising. If there is no clear vision of the project, it may lead to poorly defined goals and poor requirements (Berntsson-Svensson 2006). It is also common sense that if you do not know what should be included in the project, then it is difficult to deliver on time, within budget, and meet what the customer wants.

Adding extra personnel to meet project schedule was found to relate to project failure in Australia and Sweden. This finding confirms the findings by Berntsson-Svensson (2006). However, more successful than failed projects from Sweden added more personnel, as illustrated in Table 2. One explanation could be that the successful projects may have merely added more software testers to run test cases. This would not affect the success of a project. Changing the project manager may be related to project failure in Australia. However, it was not possible to state this relation, as there were no follow-up questions about *why* the project manager was changed. Although the literature (Standish Group 2001) emphasizes customer involvement and experienced project manager as important factors for project success, this study did not reflect those findings.

One major difference between subjects from Australia and Sweden is the perception about rewarding staff for working long hours. Almost 70% of the failed Australian projects rewarded their staff for working long hours, while none of the Swedish failed projects did. Instead, 60% of the Swedish successful projects rewarded their staff. One explanation to this result could be that subjects in Australia were asked to work long hours with a reward earlier in the project when it was unknown that the project would fail, while in Sweden reward was given for working long hours at the end of the project when it is sure that the project would be successful. Alternatively, it may be related to cultural differences. According to Verner and Cerpa (2005), financial rewards are not as important in Australia as in USA. However, our findings show they are important in Sweden.

Important Factors for Project Success

When subjects were asked to define a successful project, both subjects from Australia and Sweden had the same definition as the literature (Standish Group 2001): meeting business objectives, on time and within budget, and meeting quality requirements. This means that the literature and the industry use the same definition. However, it is not always easy to define what a successful project is. As mentioned earlier, even if a project fulfils all above criteria it may still be seen as a failure (Lewis 2001). This is also supported by one of the subjects:

"*If a project is run perfectly according to books it's a "good project", but not necessarily a successful one*"

Both subjects from Australia and Sweden also supported Baccarini (1999) definition of project success, which is shown in Section Project Success versus Product Success:

"*Business people still using the product after 2 years*"

On subject explained why their project failed:

"*When software finally was delivered, business situation had changed which meant that the product was never used*"

There was a difference between Australia and Sweden when subjects were asked to list the three most and least important factors for project success (Table 3). Subjects from Australia considered customer involvement as the most important factor for project success, while subjects from Sweden considered understanding the customer's problem as the most important factor. One explanation for this could be that subjects from Australia interpreted the importance of ensuring customer involvement as a way to understand the customer's problem. If the

customer is involved, the supplier has the ability to ask questions, which is the same as understanding the problem. One explanation why subjects from Sweden considered understanding the customer's problem as the most important factor instead of customer involvement could be, if the problem is understood, it may not be needed for the customer to be involved. It is surprising that a "good schedule" or "good estimates" are not seen as important factors from either of the two countries. Having a good schedule is stated in the literature (Standish Group 2001) as an important factor for project success. Another interesting finding is that subjects form Australia considered a committed sponsor as an important factor for project success, while subjects from Sweden considered this factor as one of the least important ones. One explanation could be that over 60% of the Australian subjects were managers, while less than 50% of the Swedish subjects were managers. However, a more likely explanation is cultural differences. According to Singh et al. (2005), Sweden does not have a strict management style (managers are seen as people that should guide the team and not as a boss), or it could be based on "uncertainty avoidance" (Singh et al. 2005). The Australians are more afraid of the uncertainty and therefore have more rules and laws, which may need a committed sponsor to make difficult and important decisions.

Important Factors for Product Success

There were interesting findings when comparing the personal view of subjects from both countries on what constituted important success factors for products. Firstly, both subjects from Australia and Sweden considered a satisfied customer as being the most important factor for product success. This is not a surprising result; if the customer is unhappy, they may not return in the future. In addition, subjects from Australia considered "great quality" as the second most important factor for product success, while subjects from Sweden considered a "working product" as one of the most important factors. The Australian result is inline with the literature (Wallin et al. 2002). The difference between the result from Australia and Sweden may be due to differences in their interpretation of 'great quality' (great quality may include a working product). Two statements from the subjects also supported this:

"*Quality of the product kept to customer's expectations*"

"*Delivering good-enough quality products that satisfy requirements and that is PERCEIVED by the customer to be of high quality and meet requirements*"

Furthermore, subjects from Sweden considered a returning customer as the second most important factor for product success, while subjects from Australia considered this factor among the three least important. One possible explanation for this result may relate to the interpretation of 'satisfied customer' (a satisfied customer may return to the supplier in the future).

VALIDITY

Four types of threats are addressed in this study (Wohlin et al. 2000).

Internal Validity

This threat may have a negative effect on the casual relationship between treatment and outcome. We believe that this study has a low threat to internal validity. The research instrument in this study was developed with a close reference to literature relating to success factors for projects and products. In addition, we conducted several pilot studies to ensure that the questions relate to the stated objects of this study. The participants in this study had to be involved in at least one completed (delivered or cancelled) software project. The differences from academic background, industry experience, and roles in their organization were documented.

External Validity

This threat is a threat that influences the research to draw incorrect conclusions from experiments. There are two threats to external validity that are relevant for this study: interaction of selection and treatment, and interaction of history and treatment (Wohlin et al. 2000). Participants were selected from different geographic locations in Australia and Sweden. Both male and female participants were represented. We used a random selection technique when selecting companies. The small sample size was another threat to the external validity of this study. The sample size may affect the conclusions hence they may not be generalized for the whole software engineering industry population. The timing of the study may be a threat. However, this study is based on data from completed software projects. Another relevant aspect is that the data is collected from the participants' latest completed software project. This minimizes the threat that the participants may have forgotten what really happened in the project.

Construct Validity

This threat is concerned with the generalization between the result and theory (Wohlin et al. 2000). Two threats to construct validity are relevant for this study: design and social (Wohlin et al. 2000). This study was carefully

designed, the design was piloted and a detailed analysis of different definitions of projects considered. To avoid evaluation apprehension, complete anonymity from other participants and companies were guaranteed. Hypothesis guessing (participant try to guess the hypothesis and support the result dependent on their attitude), there is a risk that the participant may have introduced bias to the collected data in this study. This is a threat to our study. Another threat to construct validity lies in questions where subjects should rank and include additional factors if necessary. Subjects may have thought it was easier to rank the provided factors than to propose new ones. This means that important success factors may be missing.

Conclusion Validity

Threats to conclusion validity are lack of statistical calculations or misuse of statistical assumptions that leads to incorrect conclusions made by the researcher. There may be a risk that conclusions from this study are inaccurate due to low statistical power. We did not use statistical calculations to find patterns in the result. Instead, deductive logic was used because of limited data points. To receive high reliable measures and to avoid poor question and poor layout several pilot studies were conducted. To avoid threats from treatment implementation emailed questionnaires were used as often as possible. However, if the participant wanted an interview, questions were asked in exactly the same way as in the questionnaire, which reduces bias in the collected data.

CONCLUSION

This research set out to investigate software project and product success factors from Australia and Sweden. Generally speaking, our findings confirm the results from previous studies. That is, complete and accurate requirements, good schedule estimates, well defined project scope and so forth are important factors for project success. Our findings are also inline with the literature that adding extra personnel to meet schedule estimations is related to project failure. Our contribution is that there are differences in what effect certain factors have on the success or failure for project/product across countries. This indicates that it is needed to consider the culture when addressing project/product success factors, which the current definition of what factors lead to project/product success does not take into account. In summary, our findings indicate that software developers from Australia and Sweden identify different factors for software project and product success.

Future studies need additional data to achieve more generalizable results. As discussed earlier, a larger sample size and statistical calculations would be of great value.

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ACKNOWLEDGEMENTS

We would like to thank all of the participants and their companies (both from Australia and Sweden) who have helped in making the data collection possible for this research.

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