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# OFFSHORING OF ENGINEERING SERVICES: A CASE STUDY FROM THE AUTOMOTIVE INDUSTRY

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## 1. Introduction

In order to become competitive in the global market organizations are forced to reduce costs and improve product development time to market. One growing method organizations adopt that has become popular is to globalize their product engineering design phase to an offshore subsidiary (offshoring) or a full-service provider, also known as a third-party service provider (outsourcing). Within the literature Norwood et al. [2006] highlight that there is no clear definition of what constitutes offshoring. For the purpose of this research offshoring will be termed *"engineering activities that are transferred to an organization located internationally with the capability of providing services to the client."*

The outsourcing phenomenon has been growing since organizations moved manufacturing operations to companies abroad [Kedia and Lahiri 2007] and concurrently has seen rapid growth in other sectors, such as Information Technology Outsourcing (ITO), Business Process Outsourcing (BPO) and other back-office activities. It has covered many different geographies [Beaumont and Sohal 2004] and diversification has been growing across sectors such as the automotive industry [Von Corswant and Fredriksson 2002], engineering projects [Willcocks et al. 2011], product development/design [Eppinger and Chitkara 2006], [Oberst and Jones 2006], [Javalgi et al. 2009] and manufacturing [McIvor 2005]. While this development has been extensively researched in recent years, the change within automotive organizations from high-cost countries to establishing engineering centers in low-cost countries is a relatively new phenomenon. The globalization of the automotive industry has positioned fresh countries at the forefront of a novel phenomenon with China (19.2 million), the USA (10.3 million) and Japan (9.9 million) ranked as the top three locations for passenger vehicle production in 2012 [OICA 2012]. General Motors (9.1 million), Volkswagen (8.1 million) and Toyota (8.1 million) were the top three Original Equipment Manufacturers (OEMs) to produce the most passenger vehicles in 2011 totaling to 78.9 million vehicles globally [OICA 2011]. Globalization has enabled many low-cost developing countries to compete with Western companies, forcing automotive organizations to fragment production processes across multiple regions. While this has been researched for several years a relatively new research area is automotive organizations that outsource vehicle product design offshore to reduce costs and stay competitive in the market place offshore outsourcing is dominant across businesses and is a growing topic, but the research community has only paid limited attention to this important phenomenon [Roth and Menor 2003].

This paper addresses this gap by investigating the drivers, challenges and benefits automobile organizations face when offshoring engineering work to low-cost countries. Therefore, the research question is "What are the challenges and benefits the automotive industry has experienced when offshoring engineering services to low-cost countries?" In this paper we will present a literature

review of what has led to this recent development within global product development and present the findings from a case study of a large automotive organization with headquarters in Germany. Following this, we will debate the findings and end with conclusions and notes for further research into this trend.

## 2. Literature review

Outsourcing has become increasingly popular for organizations of every size and has attracted attention from researchers aiming to understand why it occurs and practitioners trying to understand how the process can be optimized and implemented smoothly [Oshri 2009], [Willcocks et al. 2011]. However, Kotabe [1993] and Venkatraman [2004] have identified that the practice of outsourcing is not new and has existed over a number of years, with management using the practice as a common tool and outsourcing being a key issue that is discussed at board level [Quinn and Hilmer 1994]. Offshoring and outsourcing development in engineering and design is still relatively new [Burdon and Bhalla 2005] and is driven by organizations seeking to reduce costs, improve time to market, shorten development cycle times and either use an offshore center as surplus capacity support or capability development. Roth and Menor [2003] have identified that the offshore outsourcing of services requires further research in order to fully understand this complex phenomenon, since when organizations globalize their product development processes they are faced with significant challenges and inefficiencies that would not normally occur when outsourcing domestically [Graber 1996]. The offshoring of services has dominated manufacturing due to information technology globalization allowing people to work in remote locations [McIvor 2010], the world becoming more connected [Friedman 2005] and manufacturing being researched independently in terms of product development and design [Thomke and Fujimoto 2000], with this paper concentrating on the latter.

The global economic crisis of 2008 and the globalization of organizations have impacted on the automotive sector significantly [Cattaneo et al. 2010], contributing to both General Motors and Chrysler filling for Chapter 11 bankruptcy in 2008, Toyota posting losses in 2009, BMW experiencing significant profit reductions and Daimler, Fiat, Renault and Peugeot all experiencing losses. This has led organizations to reduce costs by downsizing their operations [Allen et al. 2013]. In Europe, Spyker cars acquired Saab from GM, TATA Motors acquired Jaguar Land Rover, and Geely acquired Volvo. Porsche, on the other hand, overcame the automotive crisis and in 2008 increased its stake in Volkswagen. By 2012, Volkswagen had acquired Porsche and it is now a fully owned subsidiary. These changes are not only forcing organizations to reduce costs, but to assign new global strategies [Gottfredson et al. 2005] and to disperse global product development to further reduce costs [Eppinger and Chitkara 2006] using low-cost frugal engineering design. The design and development costs of automotive vehicles are rising while profits have been falling, forcing vehicle platform designs to become standardized across multiple car lines [Maxton and Wormald 2004] and to develop effective design solutions. One of the ways to do so has been to outsource an entire activity in order to reduce costs and retain competiveness [Quinn and Hilmer 1994].

The automotive sector has seen radical changes in terms of outsourcing and how firms have globalized their operations [Ghemawat and Ghadar 2000]. In particular, design outsourcing has not received much scholarly attention [Palm IV and Whitney 2010] and because vehicle design is very complex there is an increased risk of failure even before outsourcing or offshoring has been attempted [Maxton and Wormald 2004]. Adding to the recipe of complexity, an automotive vehicle contains around 10,000 to 15,000 components [Oliver et al. 2008] and around 50% to 60% of the total cost of components comes from outsourced suppliers [Bresnen 1996]. Therefore, product design offshoring is regarded as a complex engineering product, mainly due to the interfacing of thousands of components [Tripathy and Eppinger 2007], and involves finding solutions to complex technical problems [Pahl and Beitz 1996].

The engineering design offshoring sector is growing and is estimated to be worth $750 billion per year globally, with only $10 to $15 billion being offshored [Hamilton 2006]. However, by 2020 the estimated global engineering design offshoring market is predicted to reach approximately $150 to $225 billion, as the sector is expected to grow rapidly over the next few years [Hamilton 2006].

Research conducted by Duke University in 2005 found that 36% of organizations sent engineering services offshore, with 16% contributing to the offshoring of design.
The outsourcing wave for ITO dates back to 1963 when an organization called Electronic Data System agreed a contract with Blue Cross of Pennsylvania to outsource data processing services [Lacity and Hirschheim 1993]. This marked the start of a process that demonstrated to other organizations the tangible benefits of cost reduction and productivity improvement. Comparing the automotive sector with ITO and BPO the offshoring trend is relatively recent.
The outsourcing offshoring wave started when Ford Motor Company started to produce the Ford Model T at the Trafford Park Assembly Plant in England in 1911; the motivation behind this move was the reduction of transportation costs. In the 1960s, many organizations in the United States started to move labor-intensive processes to offshore locations to reduce the costs of goods and services [Stringfellow et al. 2008].
The global product development offshoring wave started in the 1990s, with organizations still developing this trend [Eppinger and Chitkara 2006]. Product design is defined as a knowledge-based activity and generates the majority of value in services and manufacturing [Quinn 1999]. Offshoring in engineering services initially started with cost reduction due to high labor wages in the developed world. For example, General Motors offshores engineering work to reduce costs, whereas Toyota's perspective on offshoring is the ability to tap into the local market and build domain knowledge to improve quality, speed of products to market and strengthen the organization's competitive advantage [Chiesa 2000], [Thondavadi and Albert 2004]. Any organization considering outsourcing has four independent options available, as indicated in Figure 1.

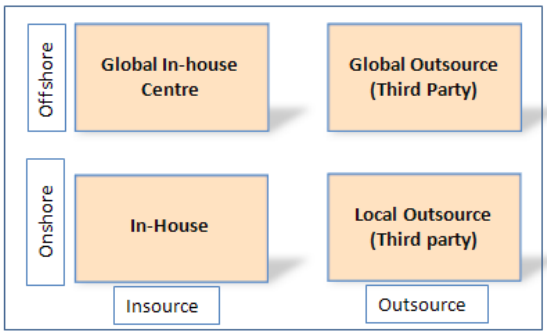


**Figure 1. Outsourcing options for organizations, adapted from [Eppinger and Chitkara 2009]**

With reference to Figure 1, for an automotive organization the options available are as follows. First, in-house: traditionally the most recognized and most popular, used when engineering design services are kept onshore and within the boundaries of the organization. Due to competitive labor rates and external pressure on organizations this option is now becoming unfavorable for organizations. Second, local outsourcing: also known as "third party", where engineering design services are offshored to an independent organization with both having different strategic visions. This arrangement is beneficial for addressing short-term capacity constraints or when local skill is not available. Third, global in-house center: still relatively new for engineering product design and offshoring, in principle engineering services are provided from an offshore location (in a developing country) where the center provides services to the parent firm. Fourth, global packets and services are provided to onshore locations. However, it involves risks relating to data confidentiality and intellectual property rights.
A recent study conducted by Aron and Singh [2005] has identified that organizations that are involved in offshoring do not meet the financial benefits expected, nor do they understand the risks involved in outsourcing offshoring. Organizations experience difficulties that mean up to half of the outsourcing contracts are terminated [Weidenbaum 2005], and in such instances this causes fears about job losses [Quinn and Hilmer 1994]. When an organization decides to offshore services, in this case engineering design, market conditions are changing so rapidly and if not fully understood could lead to management decisions on offshoring over a period of time being less cost effective and beneficial [Stringfellow et al. 2008]. A further study conducted by Amaral and Parker [2008] reviewed 100 outsourced platform design projects belonging to Fortune 1000 organizations and identified that these

organizations struggled or failed due to misaligned objectives within the organization, unexpected rivalry, poor version control of documentation and so forth.
However, an organization must fully understand that design outsourcing is probably the most complex within the outsourcing arena and if not completely understood may spiral out of control and fail to meet the cost savings originally anticipated. It takes management commitment to ensure that an outsourcing agreement is cohesively embedded within the offshoring model. There have been studies conducted by Quinn and Hilmer [1994] that have identified that managers can easily become critics of outsourcing and quietly sabotage the relationship if they want to.
This literature review has revealed that the automotive industry has seen significant changes and organizations have downsized operations or either merged or acquired organizations to maintain survival. Low labor rates have driven automotive organizations to set up low-production facilities overseas to produce vehicles at competitive rates rather than to import, thus attracting local customers and increasing both market share and portfolio awareness. There is limited research on engineering design offshoring in the automobile industry and this paper will contribute to this research area by investigating drivers and challenges regarding the offshore outsourcing of engineering design services in the automotive sector and support practitioners to further understand this phenomenon.

## 3. Methodology

The research question focuses on understanding engineering and design offshoring in the automobile sector, something that is not well understood, thus leading this research to use a qualitative approach in order to explore the research question and provide rich, deep data [Oakley 1999]. According to Gummesson [2000], when empirical data is collected from large organizations a qualitative approach provides good opportunities for obtaining the correct level of detailed information.
This research is case-based and includes three key phases: a theoretical phase, an empirical phase and a reflection on current theory based on new empirical evidence. First, an extensive literature review was carried out. Second, data was gathered from an in-depth case study and these findings were used to reflect on the current situation in the research field. Third, the theoretical and practical implications of the new knowledge were identified.
The case-study approach was selected as the most appropriate research methodology since offshore outsourcing is complex [Oberst and Jones 2006]. The explorative nature of the research question allows for an in-depth understanding of the research object [Yin 1989], for theories to be developed and built into a model, and has become an increasingly accepted methodology for use in management and engineering disciplines [Gummesson 2000]. The case-study approach delivers a rich in-depth study of a phenomenon where limited knowledge or extant knowledge seems inadequate in relation to the automotive industry being categorized as complex in terms of designing a vehicle due to the number of stakeholders involved [Yin 1994], [Maxton and Wormald 2004]. The case organization was selected based on a number of key parameters including, (i) it being an engineering organization in the automobile industry, (ii) the organization being global, (iii) possible access to management and post-senior management, and (iv) the offshoring of product design activities being present.
Interviewees were selected based on their experience with the organization's global engineering activities. Post-senior management holding positions and managers from different areas were interviewed to understand the connectivity of the engineering activities with other functional areas. The main method of data collection was through semi-structured interviews that allowed the researcher to probe additional questions and illuminate the research [Patton 2002]. This approach also ensured that the researcher did not anticipate the interviewees' replies [Berg 1998], thus leading to in-depth explanations that other interview formats may not provide [Silverman 1993]. In addition, the semi-structured interview style further allowed the researcher to request clarification on certain areas that were not so clear [Berg 2001].
In total, 10 interviews were carried out that lasted approximately 60 to 70 minutes each due to the complexity involved in offshoring product design illustrated in Table 1. Some interviewees were interviewed more than once to clarify information gained during the first interview. An interview guide was developed to ensure a consistent theme throughout the interview and areas of particular interest were better identified [Kvale 1996].

**Table 1. Interviews mapped against experience**

| Company | Interview positions | Years in organization | # of interviews |
|---|---|---|---|
| **Autos** | President, Vice President, Senior managers | 15 years, 8 years, 5 – 10 years | 5 |
| **Connect Solutions** | President, Vice President, Senior managers | 12 years, 9 years, 3 – 7 years | 5 |

All interviews were transcribed and recorded when allowed in order to ensure validity and quality in the empirical data [Legard et al. 2003]. All interview data has been coded using the NVivo 10 qualitative software package by reading through transcripts and then coding the statements from each interview. Using open coding technique 400, codes were generated and then further reduced by applying selective coding techniques that concentrate on the themes illustrated in Figure 1. A cloud analysis has been created from the codes using NVivo in order to further understand word frequency and narrow the selective coding approach, thus achieving the 10 themes illustrated in Figure 2.

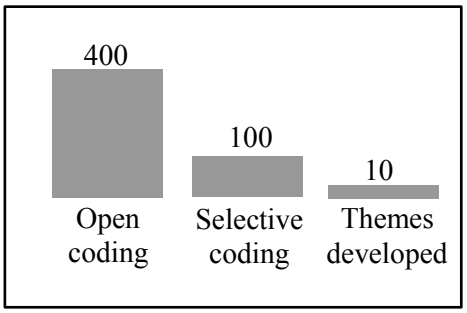


**Figure 2. Coding process**

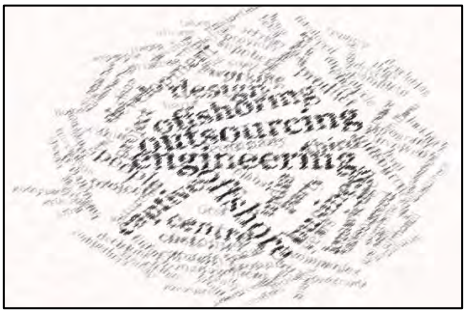


**Figure 3. Word cloud analysis NVivo**

Additional information was collated in the form of company archival documentation, strategy documents and public statements to ensure an accurate representation and enable a triangulation of the findings between different sources of information for improving validity [Mason 2002].

The case study focused on a large premium automotive organization with headquarters based in Germany. It has a global manufacturing footprint with recent joint ventures in China and India for the production of automotive vehicles for local markets.

In 2011 its global employee headcount was around 100,000. To respect all organizations and ensure anonymity each company will be given a name, with the first being called Autos.

Connect Solutions is a privately owned global subsidiary providing offshore engineering services to the automotive sector, aerospace sector and IT sector. The organization was established in 2000 and focuses mainly on the automotive industry. It has design offices based globally and employs over 4000 engineers. Connect Solutions provides offshore engineering services to another automotive Original Equipment Manufacturer (OEM) and first tier suppliers, but the Autos offshoring vehicle body engineering design contract was the largest to enter this business. Other engineering work required a very small amount of design domain knowledge.

Easy Solutions are a subsidiary with headquarters in Germany and provide specialized engineering services to the automotive and aerospace industries. This organization has a global in-house center located in India that provides low-cost offshore engineering services to Germany and the local market. It employs over 4000 people globally and is recognized for new product development, concept car development, new facility setup and so forth.

## 4. Findings

The case organization Autos faced difficulties between 2007 and 2008 due to increasingly challenging market conditions. In an attempt to reduce costs they decided to outsource their entire vehicle body

engineering design, consisting of interior design, exterior design, Body in White (BIW), Computer-aided Engineering (CAE) and other technical engineering services. By offshoring engineering design calculated savings reached around an average of €50 per hour per person, with the cost of skilled labor in Germany increasing year on year. The cost saving figure was based on Autos' hourly rate along with three years of inflation rise and the hourly rate charged by the offshoring service provider, Connect Solutions, as highlighted in the methodology section.

Autos' vehicle design cycle plan is on average 36 months from the start of a project to job one, where a finished vehicle rolls off the product line. Autos' strategic business plan was focused solely on cost cutting by offshoring the engineering design. It worked to improve cash flow within the business and take advantage of an low-cost developed country, access to educated engineers, time zone differences and reducing the engineering design cycle time to market an automotive vehicle quicker and cheaper than its competitors.

Autos decided to use a third-party offshoring organization out of the four possible options they had when globalizing the product design process, as illustrated in Figure 1. As Autos had a cost-cutting proposition, having the project remain onshore with a third party service provider did not provide any tangible benefits; keeping the project in-house would not reduce costs nor improve the cycle time and developing a global in-house center would take some years since Auto would need to build competencies and attract skilled labor. Autos therefore felt the best option was to offshore the product design process to a third party organization that was established in this sector and had relevant domain experience. They chose Connect Solutions since the organization fulfilled these requirements.

The offshoring project started in 2008 with a preliminary phase in order to prepare the organization for transitional changes. Autos' senior management team regularly travelled to Connect Solutions, ensuring that business objectives and deliverables were fully understood and that management commitment was embraced within the project. During this stage the project teams (both onshore and offshore) met in person and shared information about each other in order to establish trust and common understanding. Autos also dispatched a skilled workforce to the third-party provider in India to help with transitioning the project.

Autos committed to a three year plan with Connect Solutions in order for them become an offshore engineering service provider delivering high-end and complete automotive vehicle solutions at low cost from India. The offshore proposition was to increase workforce from a small amount to a few hundred in order to deliver the project. Therefore, the outsourcing offshoring business model was constructed to leverage more engineering design work offshore by taking advantage of labor arbitrage and simultaneously building the workforce's core competencies.

Consequently, and according to Willcocks et al. [2011], the deal can be classified as a mega deal between the two organizations estimated to have a value of $20 million dollars throughout the project lifetime.

Connect Solutions had difficulties in recruiting competent staff to complete the necessary work streams involved in offshoring engineering design work. Autos' management felt that Connect Solutions was moving ahead too slowly, which caused Autos to lose confidence and trust in the management team of Connect Solutions. A number of engineers were recruited especially for this project, but Autos felt that the daily work streams for executing knowledge-based engineering were being poorly managed, causing frustration and turbulence within the workforce. Connect Solutions was also struggling with employee retention within the organization, although this is a common issue in Indian engineering organizations. The initial phase of design offshoring started with Autos sending out engineering design packages for Computer-aided Design (CAD) modeling. The offshore model was developed such that Autos' CAD coordinators onshore would liaise with counterparts based in India (using email, desktop sharing software, conference calling) to ensure that the work streams were sent out correctly and that sufficient information was provided to complete the task. A few months into the project and Autos was facing communication problems with Connect Solutions, especially in the design phase, which included unclear messages, not having the needed level of CAD knowledge and a lack of competencies in automotive design. Autos identified that the CAE engineers working on CAD design work lacked knowledge of the fundamental design rules and also had few surfacing skills due to the unavailability of skilled labor. In addition, Autos identified that the background of the CAD

engineers was mainly that of the information technology sector and that they lacked the necessary competence needed to develop a complete solution.
From a CAE perspective, work streams were sufficient and met with Autos' quality criteria. This area of the product development process was stable.
Autos felt there were further limitations in communication and were concerned with domain knowledge experience within Connect Solutions. The communication problems involved design work being reworked by Autos' onshore teams or the offshore design not being used as it was incomplete, thus introducing additional billable hours into the project and adding costs not originally anticipated. Due to the lack of domain knowledge expertise, this brought about additional interaction between onshore and offshore designers, leading to the redesign of work packets that resulted in hidden costs being added to the project. For instance, during the interview a manager (i) at Autos stated that "work was sent back and forth around three times before it was correct and the information received from Connect Solutions was not clear and the fundamental principles were not understood."
During another interview a manager (ii) at Autos stated that "Autos has the core capability to design a complete vehicle and as an outsourced partner (Connect Solutions) with less domain knowledge the information received from Autos was not at a level easily readable, so requesting for further clarification caused delays in the design and created a number of iterations before completion."
At this stage Autos identified that the project had started to deteriorate, so they decided to review the offshore business model. Autos decided to change the offshoring model to reflect the recent challenges by positioning Connect Solutions' CAD coordinators at Autos' headquarters in Germany, these would then become the main point of contact for liaising with engineers based onshore and provide feedback to offshore teams. The model was executed for a few months and failed to meet deliverables as the workforce within Connect Solutions was not able to produce the level of quality, design innovation or creativity that Autos required. The poor quality of the engineering work was identified at Autos' onshore location where interfacing with other design components was incompatible, thus raising further questions regarding the craftsmanship of general engineering.
Figure 4 illustrates the outsourcing offshoring activity presented in a timeline format. It displays the events that occurred in chronological order.

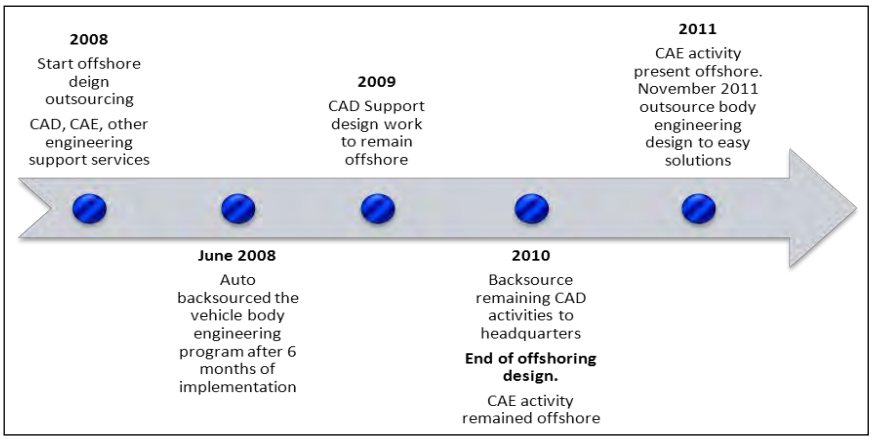


**Figure 4. Connect Solutions outsourcing offshoring events**

Three months into the project Autos appreciated that outsourcing offshoring a complete body of engineering design was not as easy as originally anticipated, and required additional support from cross-functional areas during the design process. For example, there were some disconnects between the body in white, interior, exterior, cabin and so forth that did not help the design process.
Autos felt that Connect Solutions had underestimated the project size and that in particular the organization was struggling to find the right talent with the required educational and practical experience to fulfill project expectations. In June 2008, Autos was still facing difficulties, in particular with engineering design, communication and meeting commitments. Therefore, a corporate decision was taken to backshore the entire body engineering function from Connect Solutions to Autos' headquarters in Germany as the risk of continuing the project included significant financial impact and

the delayed launch of the vehicle. Consequently, the body engineering design phase was completed in-house. Autos identified potential in having Connect Solutions do simple CAD engineering support functions, and decided to develop this relationship by retaining tasks offshore.
These offshore tasks required less experience and domain knowledge and could help to build core competences within the workforce. Connect Solutions developed support function roles that would help improve the design cycle and which only required a limited number of employees. All CAE-related work remained offshore, milestones were achieved and Autos did not have any concerns about quality. In 2010, twenty-four months after signing the outsourcing contract, all CAD support design was backshored to Autos' headquarters. Autos also identified that employees at Connect Solutions feared that their jobs were at risk since the project had been backsourced.
Between 2010 and 2011, Connect Solutions made good CAE progress, so the decision was taken to retain these tasks offshore since domain knowledge and core competencies in this area were outstanding.
However, Autos identified that due to having to backsource activities and because of challenges highlighted in this case the vehicle was launched several months late and inevitably, the project suffered financially.
In 2011, Autos' vehicle platforms were increased. In order for them to remain competitive against other vehicle manufactures they decided to review the outsourcing market and developed another business proposition. However, on this occasion the body engineering design was outsourced to a specialized third-party organization called Easy Solutions, which is recognized for its automotive developments and which has headquarters in Germany. Easy Solutions has an offshore design center based in India and is able to offer automotive organizations low-cost design solutions.
The drivers involved in domestic outsourcing were also cost driven, but Autos was short of in-house capacity and skilled labor.
The management team at Autos experienced a project that did not meet the business objectives of cost saving, despite using a low-cost country for offshoring engineering design services. Autos now has some experience in managing an outsourcing design contract, and using Easy Solutions has made the designing phase simpler due to a sharing of culture and language. This has enabled Autos to get the benefits from outsourcing that it initially wanted.

## 5. Discussion

Autos' failure with Connect Solutions occurred due to an inability to address the complications faced regarding culture, communication, quality and resource shortage. According to one model, these complications can be explained as being due to interaction intensity and interaction distance between the organization and the vendor [Stringfellow et al. 2008]. Interaction intensity consists of service content and service process. Interaction distance is based on the distance between culture and language, as well as geographical distance. By evaluating the degree of interaction distance and intensity an organization can evaluate whether to move a given task to a given location. Manufacturing organizations that offshore high-level engineering tasks within product development, product design and R&D activities to low-cost countries create a situation in which there is a high degree of interaction intensity. This emphasizes the risks involved in engineering offshoring, in particular to low-cost countries where there is greater interaction distance.
Furthermore, Eppinger and Chitkara [2006] list ten success factors for global product development among others: (1) management priority, (2) process modularity, so work packages can be segregated, (3) product modularity, so interfaces can be clearly defined, (4) core competences are identified, (5) governance and project management to coordinate and manage projects, (6) a need for a collaborative culture, and (7) organizational change management is needed to plan, train and educate staff. Autos was unable to ensure process and product modularity so a high degree of interaction was needed between the two organizations. This, combined with little training for the staff in virtual collaboration and interaction, made the collaboration between the onshore and offshore teams more difficult than Autos had anticipated. Furthermore, the organization was not used to a collaborative virtual engineering environment and the organizational changes needed to embrace this had not taken place. While the outsourcing project was given management priority there was a lack of focus regarding core

competences. This made it difficult for Autos to clearly identify its own competences and identify what it needed to learn before attempting full-scale outsourcing.
Furthermore, the vendor was located in India while Autos was in Germany. These two different cultures can generate complexity in communications due to differences between high- and low-context countries [Hall 1983]. Scarce resources can be linked to resource dependency theory where the survival of an organization is its ability to maintain its resources and capabilities [Preffer and Salancik 1978]. In the case of Connect Solutions failed to retain and attract resources, which led to the project not fulfilling Autos' requirements and ultimately a termination. It should be noted that resource shortage is a common problem in India since it is only in recent years that the country has started to educate an increasing number of engineers.
Autos' second outsourcing attempt, this time to a specialized third-party organization with headquarters in Germany, was more successful because the physical and cultural distances were much smaller, thus making it easier for Autos, a relatively globally inexperienced organization when it came to outsourcing, to succeed. In addition, the new vendor had the relevant capabilities and core competencies needed for delivering an outsourced body-engineering project.
Autos' focus on cost-cutting was most likely a key factor in its outsourcing failure since it limited the focus to other potential benefits of outsourcing offshoring, including the organizational and human aspects of outsourcing [Jiang and Qureshi 2006]. Offshoring design to a third party is not always a panacea for quick cost reduction, as has been illustrated in the case of Autos.
Autos failed to identify that when outsourcing an entire body-engineering function offshore additional complexities that were involved needed to be recognized. Senior management lacked experience in how to manage such an engagement program due to this being the first instance of globalizing their product design. Willcocks et al. [2011] have identified that when managing an offshore-outsourced project this creates additional complexity, such as time zone differences, managing dispersed teams and virtual knowledge transfer, which means that more control is needed along with more precision when defining exactly the requirements of the project. These additional complexities were overseen by the local management team and contributed to the failure of the first offshoring contract for vehicle product design.

### 5.1 Practical implications

This case study indicates that when an organization offshores its product development and design activities several elements contribute towards success or failure. These include (i) communication, (ii) alignment across all organizational layers, (iii) quality management, (iv) cross-cultural project management, (v) knowledge management, and (vi) alignment across all levels of the organizational plans.
Communicating clearly and frequently with all stakeholders, both internally and externally in relation to the organization, is essential for ensuring that everyone affected understands the process and its outcomes, as well as the 'how' and 'why'. The organization needs to align its focus and efforts across all layers, ensuring that all processes and procedures lead to a mutually beneficial outcome. To measure the outcome of an outsourcing relationship the buyer organization requires a clear strategy and a disciplined approach, imposing quality standards that can be used in an outsourcing transaction. When these steps are overlooked it becomes difficult to describe and measure the quality of the external service provider.
In order for an outsourcing relationship to be successful it is important to adopt cross-cultural project management processes and focus on knowledge management – both within the organization and with an external service provider – to ensure that key stakeholders can share the correct information with the relevant people connected to the outsourcing process. While unofficial knowledge sharing can help align projects with targets within organizations, physical and cultural distance makes this difficult in an outsourcing relationship. Finally, outsourcing or offshoring of product development and design activities requires alignment with the organization's additional plans (for example, its strategic plans and production plans).
Ensuring that such factors are planned for, managed, controlled and continuously aligned as new information surfaces, will improve the likelihood of success; it is the particular connectivity of these

factors that is essential for ensuring that an outsourcing relationship delivers the planned results. Outsourcing or offshoring cannot be viewed or implemented as an overnight quick-fix tool for an organization due to its great complexity and risky nature, as well as requiring a well-thought-out and detailed plan.

## 6. Conclusions and notes for further research

This paper investigated the challenges and benefits a premium automotive organization experienced when outsourcing engineering and design services to offshore locations. The paper presented a case study of a large multinational automotive organization that was investigated. The research question "What are the challenges and benefits the automotive industry has experienced when offshoring engineering services to low-cost countries?" has been addressed. The motivation to offshore engineering services has been driven by cost advantages in this industry. However, there are still many organizations that are unaware of the complexity of outsourcing to offshore low-cost locations, resulting in challenges such as cultural differences, misunderstandings and quality issues. These challenges cause work streams to be repeated and delay the project. One method to solve challenges as demonstrated in the case study is to lessen complexity by lessening interaction distance and complexity (for example by lessening the cultural distance between the organization and third party provider). Furthermore, a lack of preparation (e.g. trust building, management commitment and understanding) also seemed to be reasons for these challenges.

Further research is needed in order to (1) validate these results across countries and with further automotive organizations, (2) a further understanding on why some organizations succeed and others fail when offshoring design, (3) analyze the impact of each challenge (for example is culture a large or small challenge compared to the physical distance) in order to determine the most costly challenges, and (4) develop a model which addresses these challenges without having to lessen complexity so an organization can gain full advantage of the opportunities of globalization.

On a final note one should keep in mind the limitations of this research; mainly that the research is based on one case company. Therefore, the conclusions drawn here may not be generalized. Future research in the area requires investigating and testing the results.

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