IMPROVING SERVICE PRODUCTIVITY WITH TRANSFER-SUPPORTING IT COMPONENTS: DESIGN AND EVALUATION OF IT SUPPORT FOR CORPORATE TRAINING SERVICES

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Zusammenfassung

Problemstellung und Zielsetzung der Arbeit

Schlüsselfaktoren der stetig wachsenden Wissensarbeit sind sich immer wieder ändernde Arbeitsanforderungen und benötigte Kompetenzen im Unternehmen. Beeinflusst durch diese Schlüsselfaktoren ist die Teilnahme am lebenslangen Lernen zum Alltag eines jeden Arbeitnehmers geworden (Eurostat 2011; Eurostat 2012). In diesem Zusammenhang nehmen betriebliche Weiterbildungsdienstleister eine Schlüsselfunktion ein und fungieren als Partner bei der strategischen Personalentwicklung (Aguinis and Kraiger 2009; Salas et al. 2012). Aufgrund erheblicher Investitionen in betriebliche Weiterbildungen, in Deutschland allein € 33.5 Mrd. im Jahr 2013 (Miller 2013; Seyda and Werner 2014), müssen Unternehmen sicherstellen, dass diese zu einer verbesserten Unternehmensleistung führen (Saks and Burke 2012). Dies kann nur erreicht werden, wenn Teilnehmer einer betrieblichen Weiterbildung das Gelernte im spezifischen Arbeitskontext anwenden.

„Trainingstransfer“ (Transfer-of-Training) ist definiert als die effektive Anwendung und Generalisierung, sowohl von Wissen als auch Fähigkeiten und das Beibehalten von erzielten Verhaltensänderungen im Unternehmen (Baldwin and Ford 1988). Studien bestätigen, dass es einen positiven Zusammenhang zwischen der verbesserten Unternehmensleistung im Anschluss an eine betriebliche Weiterbildung und dem erreichten Trainingstransfer einer betrieblichen Weiterbildung gibt (Saks and Burke-Smalley 2014). Dies bedeutet, dass der erreichte Trainingstransfer das wesentliche Ergebnis einer betrieblichen Weiterbildung darstellt.

Allerdings zeigen Studien, dass viele Weiterbildungen nicht zu einem ausreichenden Trainingstransfer führen. Grund dafür ist, dass nur wenig von dem in der Weiterbildung erlernten Wissen effektiv im Unternehmen Anwendung findet (Baldwin and Ford 1988; Fitzpatrick 2001; Georgenson 1982; Saks 2002; Saks and Belcourt 2006). Dies macht deutlich, dass die Produktivität von betrieblichen Weiterbildungsdienstleitungen ausbaufähig ist - insbesondere die Unterstützung von Teilnehmern - damit das wesentliche Ergebnis, der Trainingstransfer, eintritt.

Dienstleistung ist charakterisiert durch die Kontextualisierung der Wertschöpfung auf die spezifischen Bedürfnisse eines Kunden, sowie durch die Zusammenarbeit zwischen Kunden und Anbietern. Studien zum Trainingstransfer bestätigen die Notwendigkeit der Kontextualisierung und der Zusammenarbeit (Grossman and Salas 2011). Betriebliche Weiterbildungen sind Dienstleistungen die im hohen Maß gemeinsam mit dem Kunden erbracht werden. Daher kann die Service Produktivität nicht durch eine Reduzierung der Inputs, bei konstanten Ergebnissen und entsprechender Qualität, erreicht werden (Grönroos and Ojasalo 2004).

Dieses Promotionsvorhaben hat daher zum Ziel, die Ergebnisse einer betrieblichen Weiterbildungsdienstleistung zu verbessern, indem der Prozess der Zusammenarbeit und der Kontextualisierung verbessert wird. Der Kunde soll insbesondere dabei unterstützt werden, die Inhalte der betrieblichen Weiterbildungsdienstleistung in Verbesserungen der Unternehmensleistung zu überführen. Dies erfordert von Teilnehmern der Weiterbildungsdienstleistungen das Gelernte auf den spezifischen Arbeitskontext anzuwenden (Baldwin and Ford 1988).

Informationstechnologie (IT) kann in diesem Zusammenhang als befähigende Instanz und als Initiator für Service-Innovationen dienen (Lusch and Nambisan 2015). Sie kann die interaktive Wertschöpfung erleichtern (Böhmann et al. 2014) und Zeit- und Raumunterschiede überwinden (Ford and Meyer 2014). Diese Möglichkeiten zur Überwindung der Grenzen zwischen Training und Arbeitskontext wurden im Rahmen der Trainingstransfer-Forschung allerdings weitgehend übersehen (Semmann et al. 2012). Daher soll ein IT-Artefakt und eine komplementäre Intervention entwickelt werden, die alle Akteure bei der Kontextualisierung und Zusammenarbeit im Rahmen von Weiterbildungsdienstleistungen unterstützt. IT-Artefakt und Intervention zielen insbesondere darauf, empirisch fundierte Determinanten des Trainingstransfers positiv zu beeinflussen, um die Trainingstransfer-Ergebnisse einer betrieblichen Weiterbildungsdienstleistung zu verbessern.

Forschungsdesign und Methodik

Diese Dissertation folgt einem gestaltungsorientierten Ansatz. Das Design-Science-Research-Paradigma dient dabei als Grundlage für die Konzipierung und Durchführung. Als ein technologie- und problemlösungsorientierter Ansatz sieht Design Science Research (DSR) die

Entwicklung von innovativen und nutzenorientierten IT-Artefakten vor (Hevner et al. 2004; March and Smith 1995). DSR enthält den Diskurs über den pragmatischen Entstehungsprozess von IT-Artefakten mit vordefinierten Eigenschaften, um reale Probleme aus der Forschung und Praxis zu lösen (Hevner et al. 2004). Neues Wissen entsteht bei diesem Paradigma durch iterative Gestaltung und Evaluation neuer und innovativer Artefakte (Myers 2013). Resultierende Artefakte können Konstrukte, Modelle, Methoden oder Instanziierungen sein (March and Smith 1995). Die allgemeine Akzeptanz von DSR als legitimer Ansatz in der Wirtschaftsinformatik-Forschung steigt seit ihrer Einführung stetig (Hevner and Chatterjee 2010; Kuechler and Vaishnavi 2008). Für die Gestaltung der Artefakte folgt dieses Promotionsvorhaben dem DSR-Paradigma von Hevner et al. (2004). Die endgültigen IT-Artefakte entsprechen einer Instanziierung (transferunterstützende IT-Komponenten), sowie eine (Trainings-Transfer-)Methode (transferunterstützende Intervention), die die IT-Artefakte in eine betriebliche Weiterbildungsdienstleistung integriert.

Zur Strukturierung der iterativen Gestaltung und Evaluation der IT-Artefakte der vorliegenden Arbeit dient die Design Science Research Methodology (DSRM) von Peffers et al. (2007). Diese bietet ein nützliches, allgemeines Modell, das auf bestehenden Ansätzen aufbaut und mit der zugrunde liegenden Perspektive des DSR kompatibel ist (Hevner and Chatterjee 2010). Es ist eine weit verbreitete und angewandte Methodik, die einen Prozess bietet, durch den DSR Anwendung findet und der als Vorlage dient, um den Forschungsprozess zu strukturieren. Der DSRM-Forschungsprozess ist in sechs Schritte unterteilt (Peffers et al. 2007): (1) „*Problemidentifikation und Motivation*“, (2) „*Definition der Zielsetzung einer Lösung*“, (3) „*Gestaltung und Entwicklung*“, (4) „*Demonstration*“, (5) „*Evaluation*“, (6) „*Kommunikation*“. Sowohl Schritt (5) *Evaluation* als auch Schritt (6) *Kommunikation* können zu einer weiteren Iteration führen. Die Forschungsergebnisse der vorliegenden Dissertation sind durch fünf DSRM-Iterationen entstanden. Experten und/oder Endbenutzer von zwei Feldpartnern werden in den Gestaltungsprozess einbezogen. Die Feldpartner sind zum einen ein betrieblicher Weiterbildungsdienstleister aus Hamburg und zum anderen ein internationaler Maschinenbauhersteller aus der Schweiz.

Der Forschungsprozess dieses Promotionsvorhabens verfolgt einen problemorientierten Ansatz und startet mit Schritt (1) *Problemidentifikation und Motivation*. Dabei werden der problemorientierte Ansatz als praktisches Problem dokumentiert und theoretische Grundlagen

anhand einer Literaturrecherche identifiziert. Zudem wird die Notwendigkeit einer neuartigen Lösung im Hinblick auf bestehende Artefakte und Forschung verdeutlicht.

Die Zielsetzung der Lösung wird im Schritt (2) *Definition der Zielsetzung einer Lösung* erarbeitet. In DSR sind die Forscher besonders verpflichtet, auf vorherige Forschung aufzubauen, um Gestaltungswissen zu erarbeiten. Um diese Anforderung zu erfüllen, folgt die vorliegende Dissertation dem theoriegetriebenen Design (theory-driven design) von Briggs (2006) und nutzt Trainingstransfer als Ergebnis-Variable und entsprechende Trainingstransfer-Determinanten als theoretische Grundlage. Die Zielsetzung der Lösung wird iterativ durch theoretische und/oder praktische Erkenntnisse aus der (5) *Evaluation* oder (6) *Kommunikation* präzisiert.

Auf Basis der in jeder Iteration abgeleiteten Anforderungen werden im Schritt (3) *Gestaltung und Entwicklung* die Artefakte (weiter-)gestaltet bzw. implementiert. Dabei durchlaufen die Artefakte verschiedene Gestaltungszustände. Diese reichen von abstrakten Konzepten über Modelle bis hin zu immer konkreteren Versionen einer Instanziierung (transferunterstützende IT-Komponenten) bzw. Methode (transferunterstützende Intervention).

Die generelle Anwendbarkeit der entworfenen Artefakte zur Lösung des in Schritt (1) identifizierten Problems wird im Schritt (4) *Demonstration* einer jeden Iteration veranschaulicht. Zusätzlich wird die Akzeptanz der wichtigsten Stakeholder bezüglich der Artefakte im realen Einsatz sichergestellt. Während des vorliegenden Promotionsvorhabens wird in den ersten zwei Iterationen ein Workshop mit Experten durchgeführt in denen die Artefakte demonstriert werden. Es werden nur Experten einbezogen, da zu diesem Zeitpunkt das Artefakt sehr abstrakt ist und die Einbeziehung von Endnutzern nicht sinnvoll bzw. möglich ist. Erst ab der dritten Iteration, bei der ein Modell (Mock-up) während eines Workshops demonstriert wird, ist die Einbeziehung von Experten und Endbenutzern sinnvoll bzw. möglich. Die fünfte Iteration dieser Dissertation beinhaltet die Demonstration der generellen Anwendbarkeit der Artefakte zur Lösung des Problems in einer realen Arbeitsumgebung mit realen Szenarien und realen Endbenutzern der zuvor erwähnten Feldpartner. Die *Demonstration* und *Evaluation* wird im Einklang und unter Verwendung des Evaluations-Frameworks für DSR (Framework for Evaluation in Design Science Research) von Venable et al. (2016) durchgeführt.

In Schritt (5) *Evaluation* einer jeden Iteration werden die Anforderungen aus Schritt (2) *Definition der Zielsetzung einer Lösung* mit den Beobachtungen aus Schritt (4) *Demonstration* verglichen. In den ersten vier Iterationen wird eine formative Evaluation durchgeführt. Evaluationsdaten werden durch teilstrukturierte Interviews erhoben. Zusätzlich zu den teilstrukturierten Interviews werden Evaluationsdaten der naturalistischen Evaluation durch Beobachtungen, Nutzereingaben im IT Artefakt und Nutzerstatistiken erfasst. Bei unzureichenden Ergebnissen wird eine neue Iteration initiiert.

Sind die Ergebnisse der Iteration für eine Veröffentlichung relevant, werden die Ergebnisse in Schritt (6) *Kommunikation* publiziert, um sich mit geeigneten Forschern und relevanten Zielgruppen auszutauschen. Vielversprechende Aspekte finden ggf. in einer weiteren Iteration Berücksichtigung. Die Kommunikation der vorliegenden Dissertation umfasst vier Publikationen bei internationalen wissenschaftlichen Konferenzen und zuletzt die Präsentation der Ergebnisse im Rahmen dieser Dissertation.

Vier Forschungsfragen werden im Rahmen der DSRM Iterationen der vorliegenden Thesis bearbeitet. Dabei ist das übergeordnete Ziel…

> ***…die Verbesserung des Trainingstransfer-Ergebnisses von betrieblichen Weiterbildungsdienstleistungen durch IT***

Da Trainingstransfer nur durch Lernen erreicht werden kann, wird ein kumulativer Forschungsansatz gewählt und bestehende Lösungen um die Transferkomponente erweitert.

Die Motivation und Problemanalyse des Promotionsvorhabens wird mit der ersten Forschungsfrage adressiert. Im Zuge dieser Forschungsfrage werden der aktuelle Forschungsstand analysiert und potenzielle Forschungsrichtungen bzw. Probleme identifiziert. Die erste Forschungsfrage (FF) lautet:

> ***FF1: Was sind die derzeitigen Einschränkungen um die Trainingstransfer-Ergebnisse von betrieblichen Weiterbildungsdienstleistungen durch IT-Support zu verbessern?***

Zur Gestaltung der transferunterstützenden IT-Komponenten untersucht die zweite Forschungsfrage, welche theoretischen und/oder praktischen Anforderungen erfüllt sein müssen, um die zuvor identifizierten Probleme zu lösen. Diese werden zum einen von der Trainingstransfer-Theorie und zum anderen durch einen iterativen Dialog mit der Praxis abgeleitet. Forschungsfrage zwei lautet daher:

> ***FF2: Welche Anforderungen sollten transferunterstützende IT-Komponenten erfüllen, um das Trainingstransfer-Ergebnis von betrieblichen Weiterbildungsdienstleistungen zu verbessern?***

Die tatsächliche Gestaltung der transferunterstützenden IT-Komponenten und die Verwendung in der transferunterstützenden Intervention werden durch die dritte Forschungsfrage untersucht. Die Forschungsfrage zur Gestaltung der Artefakte lautet:

> ***FF3: Wie müssen transferunterstützende IT-Komponenten gestaltet und verwendet werden, um die Trainingstransfer-Ergebnisse von betrieblichen Weiterbildungsdienstleistungen zu verbessern?***

Letztendlich widmet sich die vierte Forschungsfrage der Evaluation der transferunterstützenden IT-Komponenten und der korrespondierenden Intervention. Dabei werden die Wirkung und das Ergebnis des Forschungsprozesses näher analysiert. Somit lautet die letzte Forschungsfrage:

> ***FF4: Verbessern transferunterstützende IT-Komponenten die Trainingstransfer-Ergebnisse von betrieblichen Weiterbildungsdienstleistungen?***

Ergebnisse

Die Dissertation basiert auf vier zentralen Veröffentlichungen, die jeweils zur Beantwortung der Forschungsfragen beitragen.

Die erste Veröffentlichung **(Kapitel 9)** zeigt den Stand der Forschung im Bereich Trainingstransfer und Forschungslücken in der entsprechenden IT-Unterstützung auf. Dabei

werden die Theorie und Determinanten des Trainingstransfers identifiziert. Die Untersuchung verdeutlicht den sehr ausgereiften Wissensstand in den Forschungsdomänen Psychologie und Personalentwicklung. Allerdings wird auch der unausgereifte Wissensstand in der Forschungsdomäne Wirtschaftsinformatik verdeutlicht, hier hat sich die Forschung hauptsächlich auf die IT-Unterstützung des Lernens fokussiert. Lernmanagementsysteme (LMS) sind IT-Werkzeuge, die in diesem Zusammenhang weiterentwickelt werden und bei betrieblichen Weiterbildungen häufig Anwendung finden. Auf Basis von LMS Funktionalitäten und der Trainingstransfer-Theorie und -Determinanten werden die Forschungslücke aufgezeigt und initiale Anforderungen abgeleitet. Dementsprechend konnten Ergebnisse für Schritt (1) *„Problemidentifikation und Motivation“* und erste Ergebnisse für Schritt (2) *„Definition der Zielsetzung einer Lösung“* bis (6) *„Kommunikation“* des DSRM erarbeitet werden. Außerdem wird die erste und zweite Forschungsfrage adressiert, indem die Forschungslücke und potentielle Möglichkeiten, diese zu schließen aufgezeigt werden.

Die zweite Veröffentlichung **(Kapitel 10)** schließt hier an, verdeutlicht den Einfluss der Dienstleistungslogik, konkretisiert die verwendeten Methoden während der DSRM-Iterationen und dokumentiert die Ergebnisse der zweiten bis vierten Iteration. Dabei wird insbesondere auf die Ableitung des Konzepts durch theoriegetriebenes Design und die Durchführung der Evaluation eingegangen. Theorie und Determinanten des Trainingstransfers nehmen in diesem Zusammenhang eine zentrale Rolle ein. Die Gestaltung und Evaluation von einem Konzept hin zu einer Instanziierung generiert dabei sowohl neue theoretische als auch praktische Anforderungen. Insbesondere wird die Einbettung der transferunterstützenden IT-Komponenten in eine weiterentwickelte Intervention und die Aktivierung von Endnutzern konkretisiert. Ein erster Prototyp der transferunterstützenden IT-Komponenten und der transferunterstützenden Intervention wird dabei einer formativen Evaluation unterzogen. Die Ergebnisse zeigen auf, dass die Artefakte schon sehr ausgereift sind. Für die Einführung der Artefakte in eine naturalistische Evaluation müssen allerdings noch neue Anforderungen in die Gestaltung einfließen. Mit dieser Veröffentlichung konnten die Forschungsfragen zwei, drei und vier adressiert werden, indem das Konzept zu einer Instanziierung überführt, die Einbettung in einer Intervention konkretisiert und die Ergebnisse sowohl mit Experten als auch Endnutzern formativ evaluiert wurde.

Eine dritte Veröffentlichung **(Kapitel 11)** demonstriert, inwieweit sich die transferunterstützenden IT-Komponenten von Softwareprodukten unterscheiden, die in der transferunterstützenden Intervention Anwendung finden könnten. Identifiziert werden zum einen *Moodle* als führendes Lernmanagementsystem und zum anderen *Basecamp* als führendes (Online-) Projektmanagementsystem. Die vergleichende Evaluation zeigt auf, dass sowohl Lernmanagementsysteme als auch Projektmanagementsysteme alleine nicht ausreichen, um den Trainingstransfer von betrieblichen Weiterbildungen zu verbessern. Überaschenderweise sind es Projektmanagementsysteme, die besser geeignet sind den Trainingstransfer zu unterstützen. Allerdings unterstützen nur Lernmanagementsysteme das Lernen, das eine Vorbedingung des Trainingstransfers ist. Daher fokussiert sich die Untersuchung darauf, wie Lernmanagementsysteme konzipiert sein müssten, um den Trainingstransfer von betrieblichen Weiterbildungsdienstleistungen zu unterstützen. Diese Veröffentlichung liefert theoretische Ergebnisse sowohl für Schritt (5) *„Demonstration“* als auch (6) *„Evaluation“* und adressiert die vierte Forschungsfrage.

Abschließend fasst die letzte Veröffentlichung **(Kapitel 12)** die Ergebnisse der ersten vier DSRM-Iterationen zusammen, dokumentiert die fünfte Iteration und illustriert die naturalistische Evaluation der Artefakte. Insbesondere werden die endgültige Gestaltung und die naturalistische Evaluation der transferunterstützenden IT-Komponenten und die transferunterstützende Intervention präsentiert. Die bisherigen Veröffentlichungen umfassten die anfängliche Gestaltung und formative Evaluation. In dieser Veröffentlichung wird eine überarbeitete und erweiterte Gestaltung der Artefakte vorgestellt. Die naturalistische Evaluation zeigt, dass die transferunterstützenden IT-Komponenten und Intervention den Trainingstransfer von betrieblichen Weiterbildungsdienstleistungen verbessert. Die Ergebnisse liefern wiederverwendbares Gestaltungswissen für die Bewältigung des Trainingstransfer-Problems von betrieblichen Weiterbildungsdienstleistungen. Dementsprechend werden abschließende Ergebnisse für die letzte, fünfte Iteration des DSRM erarbeitet und die Forschungsfragen drei und vier abschließend beantwortet.

Theoretischer Beitrag

Die vorliegende Dissertation leistet theoretische Beiträge zur Trainingsforschung, Dienstleistungsforschung und zur Gestaltungsforschung (Design Science Research). Im Zusammenhang mit der Trainingsforschung erarbeitet dieses Promotionsvorhaben

Gestaltungswissen, wie die vorhandene Theorie und Determinanten des Trainingstransfers (Baldwin and Ford 1988) durch IT-Komponenten unterstützt werden können, um die Trainingstransfer-Ergebnisse von betrieblichen Weiterbildungsdienstleistungen zu verbessern. So kann die Wirkung von Trainingstransfer-Determinanten durch IT-Komponenten verstärkt werden. Zusätzlich wird Gestaltungswissen erarbeitet, wie entsprechende IT-Komponenten in eine Intervention eingebettet werden können und Teilnehmer Schritt für Schritt zur Anwendung des Gelernten im Arbeitskontext führen. Zusätzlich zeigt diese Dissertation besondere Herausforderungen der Integration und Evaluation von IT-Artefakten in komplexe Dienstleistungssysteme auf. In diesem Kontext wird zum einen aufgezeigt, dass die Bewältigung der Herausforderungen noch nicht ausreichend in der Forschung beschrieben ist und zum anderen wie die Herausforderungen bewältigt werden können.

Der zentrale Beitrag dieser Thesis ist die Gestaltung und Evaluation der transferunterstützenden IT-Komponenten und deren Anwendung in einer betrieblichen Weiterbildungsdienstleistung. Die transferunterstützenden IT-Komponenten und die komplementäre Intervention zielen auf eine Anwendung des Gelernten im Arbeitskontext durch Verbesserungsprojekte. Dabei wird insbesondere die Kontextualisierung und Zusammenarbeit zwischen den Akteuren fokussiert. Dies ermöglicht dem Unternehmen, die Trainingsinhalte in das Unternehmen zu überführen, um die Verbesserung der Unternehmensleistung zu gewährleisten.

Praktischer Beitrag

Neben ihrer wissenschaftlichen Relevanz sind die Forschungsbeiträge dieser Dissertation auch für die Praxis relevant. Ein zunehmendes und umfangreiches Marktvolumen zeigt den wachsenden Bedarf an betrieblichen Weiterbildungsdienstleistungen, die die Unternehmensleistung verbessern. Allerdings ist die Wirksamkeit dieser Dienstleistungen durch Probleme bei der Anwendung, Verallgemeinerung und Erhaltung von Gelerntem im Arbeitskontext begrenzt. Die Verbesserung des Trainingstransfers durch Nutzung von Trainingstransfer-Determinanten und den Möglichkeiten von Dienstleistungssystemen führt zu einem wertvollen praktischen Beitrag. Dieses Promotionsvorhaben zeigt die Wirksamkeit der resultierenden IT-Artefakte in einer naturalistischen Evaluation. So können die transferunterstützenden IT-Komponenten und die entsprechende transferunterstützende

Intervention von betrieblichen Weiterbildungsdienstleistern genutzt werden, um mit dem Kunden einen Mehrwert zu schaffen und das Trainingstransfer-Ergebnis zu verbessern.

Die Nutzung der transferunterstützenden IT-Komponenten führt zu einem wachsenden Wissensarchiv über erfolgreichen Trainingstransfer. Da die Endnutzer der IT-Komponenten in diesem Wissensarchiv suchen können, erleichtern die Komponenten zusätzlich den Wissenstransfer innerhalb des Unternehmens. Neben der Verbesserung des Trainingstransfers führt die Erleichterung des Wissenstransfers zum Wettbewerbsvorteil für Unternehmen (Argote and Ingram 2000). Zusätzlich erleichtern die IT-Komponenten die Suche nach Experten im Unternehmen.

Die beträchtliche Transparenz und die Unterstützung von Unternehmen bei der Verbesserung von Arbeitsprozessen können zu neuen Dienstleistungen für betriebliche Weiterbildungsdienstleister führen. Da sie bei der Generierung von Wissen und Fähigkeiten tatkräftig mitarbeiten, erhalten sie tiefe Unternehmenseinblicke. Diese können genutzt werden, um Service-Innovationen beim Dienstleistungskunden zu platzieren. Die Unternehmenseinblicke führen zusätzlich zu einem verbesserten Trainingstransfer, da der Anbieter die Schulung an die Bedürfnisse oder Strategie des Kunden besser anpassen kann.

Abschließend erleichtern die transferunterstützenden IT-Komponenten und die entsprechende Intervention die Evaluation des Trainings, da die Anwendung von Gelernten durch die Komponenten dokumentiert wird.

Ausblick

Nicht alle Determinanten des Trainingstransfers werden in der vorliegenden Dissertation berücksichtigt. Daher könnte ein Forschungspfad die Einbindung der Trainingstransfer-Determinante *Lerner-Charakteristik* sein. Informationen aus Human Resource Systemen könnten den transferunterstützenden IT-Komponenten wichtige Informationen liefern, damit Trainer oder Koordinatoren in Zusammenarbeit mit den Teilnehmern noch effizienter zusammenarbeiten können. Informationen über fehlende Fähigkeiten der Teilnehmer könnten während der Weiterbildung zur weiteren Verbesserung der Trainingstransfer-Ergebnisse führen. Umgekehrt könnten verbesserte Lerner-Charakteristiken gemessen und an das Human Resource System weitergegeben werden. Außerdem zeigt die vorliegende Dissertation nur die Wirksamkeit der transferunterstützenden IT-Komponenten in Kombination mit der

transferunterstützenden Intervention auf. Die Wirkung von weiteren Interventionen in Kombination mit den transferunterstützenden IT-Komponenten wird in dieser Dissertation nicht untersucht.

Ein weiterer Pfad könnte die Suche nach einer besseren Lernmanagementsystem-Metapher sein. Die Mehrheit der Lernmanagementsysteme nutzt aus historischen Gründen die asynchrone virtuelle Klassenzimmer-Metapher (Hiltz 1994; Papastergiou 2006). Der Schwerpunkt der Lernmanagementsysteme, die diese Metapher integrieren, ist die Unterstützung von Lehren und Lernen sowie der Abbau von physikalischen Grenzen traditioneller Klassenzimmer (Hsu et al. 1999). Die vorliegende Dissertation zeigt, dass eine wesentliche Barriere zur Unterstützung des Trainingstransfers durch Lernmanagementsysteme die Nutzung der virtuellen Klassenzimmer-Metapher ist.

Ein Forschungspfad könnte auch die umfangreichere Einbeziehung der Trainingsevaluation sein. Für die Evaluation des Trainingstransfer-Ergebnisses könnte die Einbindung eines Trainingsevaluations-Vorgehens, zum Beispiel das Phillips' Five-Level Model sinnvoll sein (Phillips 1995). Die IT-Komponenten könnten den Evaluationsaufwand und die Kosten für das Phillips-Five-Level-Modell reduzieren. Außerdem könnten die Komponenten KPI Änderungen verfolgen und den Return on Investment berechnen. Dashboards für Vorgesetzte und Trainingskoordinatoren könnten einen agilen Wechsel der Interventionskonfiguration unterstützen.

Stichworte: Betriebliche Weiterbildungsdienstleistungen, Gemeinsame Wertschöpfung, Dienstleistungs-Systeme, Trainingstransfer, Trainingsevaluation, Unternehmensleistung, Gestaltungsorientierte Forschung

Abstract

Organizational, technological, and competitive advances have led to changing job requirements and thus to increasing participation in lifelong learning (Eurostat 2011; Eurostat 2012; London and Mone 1999). Corporate training services are key contributors to lifelong learning and strategic human resource partners of organizations (Aguinis and Kraiger 2009; Salas et al. 2012). Corporate training service is a growing, substantial multibillion-dollar industry worldwide (Miller 2013; Seyda and Werner 2014). For organizations to benefit from their investments, participants in corporate training must apply their learnings in the work context. Transfer-of-training involves participants' effective application, generalization, and maintenance of learnings, trained skills, and behaviors from the training to their work context (Baldwin and Ford 1988), and it is positively related to business performance (Saks and Burke-Smalley 2014). However, few participants apply what they have learned in training within the work context (Saks and Belcourt 2006). The low output with respect to transfer-of-training and the related insufficient return on investment is a serious problem and indicates that corporate training services suffer from low productivity.

The traditional thinking about productivity has limited value when applied to service (Grönroos and Ojasalo 2004). Service productivity cannot be managed solely by service providers because service customers provide critical inputs, collaborate with service providers in creating value, and accrue benefits from the service (Grönroos and Ojasalo 2004). Service productivity improvements thus need to address the customers' involvement in the value co-creation process and the customers' ability to appropriate the service value in the customers' contexts (Bitzer and Söllner 2013). Corporate training service is a specific instance of a highly co-created service that seeks to provide learning success in order to enable the application of learnings by participants as well as the behavioral change of participants on the job and thus to improve organizational performance (Baldwin and Ford 1988; Bitzer et al. 2011; Kirkpatrick 1998). Achieving this output requires collaboration between training actors and contextualization to meet the specific work related training needs of participants (Bitzer and Söllner 2013), which is a complex and time-consuming service process (McLaughlin and Coffey 1990).

Therefore, this thesis focuses on this service process by facilitating the transfer-related collaboration between all involved actors of value co-creation in order to improve the ability

of customers to appropriate the value of training in the form of organizational performance improvements. This appropriation requires participants to generalize learnings and to apply them to the work context. Transfer-of-training is the output of this process. Determinants of successful transfer-of-training are learner characteristics, intervention design, and work environment (Saks and Burke 2012).

Information technology (IT), as part of the corporate training service system, can be an enabler and initiator for service innovation by establishing a value network (Lusch and Nambisan 2015), can facilitate value co-creation (Böhmann et al. 2014), and can overcome boundaries between training and the work context as well as differences in time and space (Ford and Meyer 2014). Surprisingly, this has largely been overlooked in transfer-of-training research (Semmann et al. 2012). Thus, the overall aim of this dissertation is to facilitate improvements in the output productivity of corporate training services by influencing the transfer-of-training determinants through IT support and thus strengthening the transfer output of these services.

This thesis is based on and contributes to training research, service science research, and design science research. First, by proposing transfer-supporting IT components and a complementary transfer-supporting intervention this thesis contributes to training research. From a service productivity perspective, determinants of transfer-of-training are utilized as theoretical guidance to facilitate the transfer-related service process and to improve the transfer-of-training output of corporate training services by IT. The utilization of these artifacts also facilitates the evaluation of training and makes more likely the evaluation of transfer-of-training in practice. Second, through the integration of transfer-supporting IT components into learning management systems, this thesis illustrates how learning management systems can be designed with the capability of supporting transfer-of-training. Finally, this research provides an example of the cumulative design of IT artifacts in complex service systems and as an extension of design science research methodology activities. The extension is attributable to the fact that artifacts designed for complex service systems need to be accepted and used by several actors (service providers and customers; external partners) to enable researchers to naturalistically evaluate them.

Keywords: Corporate Training Service, Value Co-Creation, Service Systems, Transfer-of-Training, Training Evaluation, Organizational Performance, Design Science Research

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List of Abbreviations

CES	Corporate Education Service
CEO	Chief Executive Officer
DSR	Design Science Research
DSRM	Design Science Research Methodology
FF	Forschungsfrage
G-D logic	Goods-Dominant Logic
IS	Information Systems
IT	Information Technology
RQ	Research Question
S-D logic	Service-Dominant Logic
SL	Service logic
FEDS	Framework for Evaluation in Design Science Research
LMS	Learning Management System
TOT	Transfer of Training

1 Introduction

1.1 Motivation

The workforces of organizations in industrialized countries are currently undergoing a dynamic socioeconomic and technological structural change (Brynjolfsson and McAfee 2012; Sonntag and Stegmaier 2007). In line with the structural change, the skills and knowledge of employees are increasingly critical for the performance, competitiveness, and innovation of organizations (Boudreau and Ramstad 2005; Guthrie 2001). According to the annual survey of CEOs' major challenges in *The Conference Board CEO Challenge 2015 Report*, human capital and the availability of skilled employees remains the top priority (Mitchell et al. 2015). Due to organizational, technological, and competitive advances, job requirements are changing quickly (London and Mone 1999). As key drivers of the rising prevalence of knowledge-based work, changing job requirements lead to increasing participation in lifelong learning (Eurostat 2011; Eurostat 2012). Corporate training services are key contributors to lifelong learning (Salas et al. 2012) and are strategic human resource practices of organizations (Aguinis and Kraiger 2009).

Thus, it is not surprising that corporate training service is a growing multibillion-dollar industry worldwide. In 2010, an estimated €28.6 billion was spent in Germany on corporate training services (Seyda and Werner 2011), and by 2013, organizations in Germany spent more than €33.5 billion on these services. Ninety percent of German organizations invest in corporate training service for their workforces (Seyda and Werner 2014), while organizations in the United States spent an estimated $164.2 billion in 2012 on corporate training service. This illustrates that corporate training service has grown into a substantial industry in recent years, and organizations recognize its importance. At the same time, studies reveal that training research is still required (Pfeiffer and Kaiser 2009).

Hence, it is no surprise that organizations are concerned that their high investment in corporate training should result in a competitive advantage and improved business performance (Salas and Cannon-Bowers 2001; Salas et al. 2012). Research indicates that organizations clearly benefit from corporate training through positive job attitudes, improved training effectiveness, and business performance (Inn et al. 2010; Tharenou et al. 2007). However, participants in corporate training services must apply their learnings in the work

context for organizations to benefit from their training investments. This makes transfer-of-training a key output of corporate training services. Transfer-of-training involves participants' effective application, generalization, and maintenance of learnings, trained skills, and behaviors from the training to their work context (Baldwin and Ford 1988). According to Saks and Burke-Smalley (2014), transfer-of-training is positively related to business performance and is a mediating variable between corporate training and business performance. Thus, investments in corporate training services will lead to improved business performance only if the corporate training results in successful transfer-of-training.

Unfortunately, few participants apply their learnings effectively on the job following a training program; this issue is known as the transfer-of-training problem (Michalak 1981). The first research in this field that indicated there was a transfer problem reported that only 25% of training participants tried to apply new knowledge and skills in the work context (Baumgartel and Jeanpierre 1972). Estimates by Georgenson (1982) revealed that only 10% of investment into corporate training led to behavioral change. Finally, Saks and Belcourt (2006) survey data suggested that only 40% of participants used on the job what they had learned in training. Given the huge investment into corporate training services each year, the low transfer-of-training output is a serious problem, as corporate training services are unlikely to improve the performance of organizations (Kozlowski et al. 2000). The problem also indicates that corporate training services suffer from low productivity. Thus, transfer-of-training is a core issue for both researchers and practitioners (Burke and Hutchins 2007).

The traditional view of productivity has limited value in the service domain. In particular, the premises of constant input and output quality cannot be applied to service. Service providers along with customers usually produce and consume the service simultaneously through co-creation. Caused by the different behavior of the customer in the co-creation, the input and output quality of the service varies (Grönroos and Ojasalo 2004). Co-creation can be divided into value facilitation, value co-creation, and sole value creation (Grönroos 2009). Initially, the service provider creates an offer through the combination of knowledge and skills to facilitate the value. If necessary, the customer acts as a co-producer to provide critical inputs to contextualize the offer. Throughout the value co-creation, the service provider and customer collaborate in creating value. During sole value creation, the customer applies obtained resources and concentrates on the individual value creation process. Hence, service

can be characterized by the contextualization of value creation to the specific context of a customer as well as by collaboration between customers and providers (Böhmann et al. 2014).

In line with the definition by Grönroos (2009), corporate training service is an instance of a highly co-created service. Initially, in the pretraining phase, the customer must share need-related knowledge for the design and customization of the corporate training service (Baldwin et al. 1991; Tannenbaum and Yukl 1992). During the training phase, trainers are involved in instructing participants with general rules and theoretical insights as well as in collaborating with participants, supervisors, or mentors in working out how to apply particular knowledge and skills in their individual work contexts (Machin 2002; Tannenbaum and Yukl 1992). Finally, in the post-training phase, participants are expected to apply the learnings from the training in their individual work contexts and may collaborate with trainers, peers, mentors, or supervisors to receive support (Cromwell and Kolb 2004; Tannenbaum and Yukl 1992). Thus, training customers as well as providers must collaborate, and the training must be contextualized to meet the customers' training needs.

In a highly co-created service, a reduction of inputs while still expecting constant outputs and a certain degree of quality will not lead to improved service productivity (Grönroos and Ojasalo 2004). However, the approach of this thesis is to improve the service productivity of corporate training by focusing on collaboration and contextualization to empower customers to appropriate the value of the training in the form of organizational performance improvements. This appropriation requires participants to generalize learnings and apply them to their work context. Transfer-of-training is the output of this process (Baldwin and Ford 1988).

A large number of determinants to improve transfer-of-training have been identified, and empirical evidence has been demonstrated in research, but these results are rarely applied in practice (Hutchins and Burke 2007; Saks and Belcourt 2006). Surprisingly, the use of information technology (IT) in enabling transfer-of-training has been largely overlooked in the training research (Bates 2005; Green and McGill 2011; Hoic-Bozic et al. 2009; Martinez-Aceituno et al. 2010; Salas and Cannon-Bowers 2001; Salas et al. 2012; Wang and Wentling 2001), although IT could be an enabler and initiator of service innovation (Lusch and Nambisan 2015). Through the enabling of the establishment of a value network, actors can share and integrate resources and knowledge. IT can also facilitate value co-creation through

contextualization and collaboration (Böhmann et al. 2014). Boundaries between training and work context as well as differences in time and space can be overcome by IT (Ford and Meyer 2014).

Corporate training services leads to transfer-of-training if participants learn and retain the training content (Baldwin and Ford 1988). However, the use of IT to enable learning has already largely been examined by researchers and is known under the term "blended learning." A blended learning setting combines technology-enhanced learning and interactive face-to-face courses to improve the learning and retention of participants within training (Arthur Jr. et al. 2003; Gribbins et al. 2007), and the prevalence of blended learning is rapidly growing (Bonk et al. 2006). This indicates that the use of IT in corporate training services is a promising approach to improving the output of these services. Learning management systems (LMS) are widely used technology-enhanced learning tools in blended learning settings (Bradstreet 2012), but they do not yet provide support for transfer-of-training (Semmann et al. 2012). Thus, this thesis seeks to effect improvements in the productivity of corporate training services by strengthening the transfer-of-training output through transfer-supporting IT components.

To design transfer-supporting IT components, this thesis follows the design science research (DSR) paradigm (Hevner et al. 2004). DSR introduces principles for the scientific construction of innovative artifacts. In particular, researchers are required to build on prior research to advance design knowledge (Hevner et al. 2004). To fulfill this requirement, this thesis follows theory-driven design (Briggs 2006) and utilizes transfer-of-training as the intended output variable with transfer-of-training determinants as the theoretical guidance. The final design artifact of this thesis is an instantiation as well as an adapted training method that integrates the instantiation into corporate training service (March and Smith 1995). The iterative development of the artifacts follows the design science research methodology (DSRM) by Peffers et al. (2007), which is an instantiation of DSR. Guided by the "Framework for Evaluation in Design Science Research" (FEDS) by Venable et al. (2016), formative evaluation is conducted in the first four iterations. Finally, a summative naturalistic evaluation approach is chosen in iteration five with real users, a real problem, and a real system.

1.2 Structure of this Thesis

The research described in this thesis is based on the DSR paradigm by Hevner et al. (2004) and is organized according to DSRM (Peffers et al. 2007). The structure of this thesis is divided into wrapper and publications parts, as reflected in table 1. The publications are framed by the wrapper, in which the context and the results of the publications are presented in relation to the research questions.

Wrapper	**1. Introduction**	**2. Research Area and Objectives**	**3. Research Design**	**4. Publications**
	5. Theoretical Contribution	**6. Practical Contribution**	**7. Limitations**	**8. Implications for further Research**
Publications	9. Managing for Transfer-of-Training: Directions for the Evolution of Learning Management Systems			
	10. Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design			
	11. Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be			
	12. Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services			

Table 1: Structure of this thesis

In the first chapter, the *introduction* of the *motivation* and the *structure of this thesis* are discussed. The *research area and objectives* of this thesis are explained in the second chapter. The third chapter illustrates the *research design*, in particular the *DSR paradigm* and the *application of research methodologies, theories, and frameworks* in this thesis. The following chapter describes the *publications* that directly or indirectly relate to this cumulative thesis. Information systems (IS) research emphasizes the need to publish both the theory and practical contributions of DSR projects (Baskerville et al. 2011). Thus, *theoretical contributions* are discussed in the fifth chapter, and the sixth chapter presents the *practical contributions* of this thesis. In the seventh chapter, the research *limitations* are described. Finally, chapter eight illustrates *implications for further research* that originate from this research, followed by the chapters that contain *published publications* that directly relate to this cumulative thesis.

2 Research Area and Objectives

2.1 Service, Service Logic, Service Productivity, and Service Systems

Rooted in economic science, the term "service" has a variety of alternative definitions in different research fields (Edvardsson et al. 2005a; Edvardsson et al. 2005b), including economics, marketing, operations, computer science, systems engineering, design, psychology, and service science (Spohrer et al. 2011). This thesis, however, is inspired by service definitions from the computer science and marketing research fields.

Service as a notion in computer science is defined as a distributed component that is self-contained, has an interoperable user interface, is dynamically bound, and is discoverable (Crawford et al. 2005). Broadly speaking, service in computer science is a software artifact that provides functions (Buhl et al. 2008). As mentioned previously, one of the final design artifacts of this thesis is an instantiation, which is implemented as a software artifact, or more precisely, as a service that is accessible via the Web.

However, the traditional economic perspective on the notion of "service" is rooted in a product-centered mindset (Edvardsson et al. 2005b). This traditional perspective on service has been criticized as being too narrow and as utilizing outdated characteristics (Sawhney 2006). As a result, scientific discussions on the perspective of service have increasingly become the focus in marketing in recent years. The contribution of Vargo and Lusch (2004) is particularly significant, introducing the much-cited service-dominant logic (S-D logic). The claim of S-D logic is not limited to service marketing but is, rather, universal (Vargo and Lusch 2008). In contrast to goods-dominant logic (G-D logic), S-D logic focuses on the exchange of service and not on the exchange of goods. The authors no longer distinguish between goods and services and define service as *"the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself"* (Vargo and Lusch 2004, p. 2).

In contrast to the three key aspects of G-D logic (Vargo and Lusch 2004), which include tangible resources, market transactions, and a passive demand, Vargo and Lusch (2004) devised eight foundational premises for S-D logic. These premises focus on the fundamental role of service, intangible resources, the relevance and active role of the customer, indirect exchange processes, the unique generation of benefits by the beneficiary, and the subordinate

importance of goods (Vargo and Lusch 2004). The initial eight foundational premises from 2004 were later updated and expanded to ten by Vargo and Lusch (2008). A recent publication updates as well as expands the premises to eleven and emphasizes five core axioms through a hierarchy of the foundational premises (Vargo and Lusch 2016, p. 8): (A1) *"Service is the fundamental basis of exchange,"* (A2) *"Value is co-created by multiple actors, always including the beneficiary,"* (A3) *"All social and economic actors are resource integrators,"* (A4) *"Value is always uniquely and phenomenologically determined by the beneficiary,"* and (A5) *"Value co-creation is coordinated through actor-generated institutions and institutional arrangements."* In the following, each axiom is explained in more detail.

(A1) The first axiom is based on five fundamental premises and emphasizes that any economic exchange is a service, for example, in the application of an actor's specific resources (knowledge and skills) for the benefit of another actor. Actors exchange services as they seek to become better. The term "service," a process, is highlighted as a singular term, because the term "services" is viewed in G-D logic as an intangible output unit. Placeholders that can be seen as indirect service exchanges might mask the fundamental basis of the exchange (Vargo and Lusch 2008). All economies are service economies, and goods are only distribution channels for the service provision (Vargo and Lusch 2004). The fundamental sources of strategic benefit are knowledge and skills (operant resources) (Vargo and Lusch 2016).

(A2) The next axiom is based on three fundamental premises. It argues that value is co-created through the direct or indirect interaction of multiple actors and always including the beneficiary. Value arises in the use of the exchanged resources, in conjunction with resources provided by other actors and in a specific context. This value creation is unfolded over time by continuing exchanges, implicit contracts, and relational norms. According to Vargo and Lusch (2004), the locus of value creation shifts from the producer to the customer and from "value-in-exchange" to "value-in-use". S-D logic uses the term "value-in-context" to emphasize that value has to be understood in context of the beneficiary, associated resources, and other actors (Edvardsson et al. 2011). Value co-creation is not to be confused with the optional co-production which refers to the active participation of customers in the design, creation, or definition of the offer (value preposition) (Vargo and Lusch 2016). Hence, value

co-creation is a collaborative process of service for service exchange in a specific context (Böhmann et al. 2014; Chandler and Vargo 2011) and across organizational boundaries (Edvardsson et al. 2011).

(A3) According to the third axiom, all economic and social actors integrate different knowledge and skills to offer and provide service (Vargo and Lusch 2008). The resource-integrator concept is not only applicable to the provider; rather, it is applicable to all economic and social actors, for example, the customer. Service providers integrate micro-specialized actors to offer and provide service that customers want and will pay for. Exchange is motivated and constituted by the unique application of uniquely integrated resources. Hence, it is important to consider the integration of resources and different characteristics as well as possible combinations of these resources to support value creation (Vargo and Lusch 2006). The generic resource integrator is designated with the term "actor" but alternatively can be designated with the term "service system" (Vargo and Lusch 2008), which is discussed at the end of this section.

(A4) This axiom emphasizes the term "beneficiary," which reflects the generic nature of the actors. In a mutual exchange of service, both providers and beneficiaries are actors. Value is experiential, as all value propositions are perceived and integrated differently by each actor. Thus, value must be understood as a holistic combination of resources that lead to value in the context of other resources (Chandler and Vargo 2011). Value, therefore, is always unique to a single actor and, thus, can only be determined with that actor. The exchange of service starts only if the beneficiary approves the value preposition. However, the perceived value can differ from the value preposition (Vargo and Lusch 2008).

(A5) Finally, the last axiom introduces institutions and the coordination of value-creating actors through institutions in a service ecosystem. Institutions are *"humanly devised rules, norms, and beliefs that enable and constrain action and make social life predictable and meaningful"* (Vargo and Lusch 2016, p. 11). Thus, actors are able to base their decisions on heuristics and need not reassess and evaluate every decision-making situation. Actors are enabled by institutions to overcome time and cognitive constraints in service exchange and value co-creation. These institutions and institutional arrangements also illustrate the structure and functioning of service ecosystems and are thus a key to understanding value co-creation.

However, this benefit of institutions comes at a potential expense, as institutions can lead to ineffective dogmas, ideologies, and logics (Vargo and Lusch 2016).

The initial eight foundational S-D logic premises in Vargo and Lusch (2004) have caught the attention of many researchers. For example, Grönroos (2006) criticized S-D logic and proposed a challenging service logic (SL). This discourse is still being carried out today (Grönroos and Gummerus 2014; Vargo and Lusch 2016). Grönroos and Gummerus (2014, p. 208) define service as *"support for an individual's or organization's everyday processes in a way that facilitates (or contributes to) this individual's or organization's value creation."* According to Grönroos (2009), co-creation can be divided into value facilitation, value co-creation, and sole value creation. Initially, the service provider creates an offer through the combination of knowledge and skills to facilitate the value. If necessary, the customer acts as a co-producer to provide critical inputs to contextualize the offer. Throughout the value co-creation, the service provider and customer collaborate in creating value. During sole value creation, the customer applies obtained resources and concentrates on the individual value creation process. As part of the SL, and based on a more sophisticated understanding of value creation, an adaptation of three premises is proposed (see premises 6, 7, and 10 in Grönroos and Voima (2013)). While the S-D logic implies "value co-creation," always by provider and consumer, SL also takes provider-independent "value creation" into account. The differentiation of value creation in SL can be considered as a conceptual extension of the S-D logic. Thus, value creation is assigned to the provider sphere, the joint sphere, or the customer sphere, depending on the activity of the provider and customer.

In the provider sphere, the provider is in focus and creates potential value, which the customer can transform into real value. The provider acts as a mediator of value, or as a "value facilitator," by, for example, the manufacture and offer of resources that can be used by the customer. Within the customer sphere, the customer independently creates value by interacting with the resources of the provider. In the joint sphere, the customer is still responsible for value creation, but the provider has the opportunity to influence it, either positively or and negatively, through direct interaction (Grönroos and Voima 2013). This value creation and co-creation process is not necessarily linear. According to Grönroos and Gummerus (2014, p. 218), *"Different spheres and corresponding value creation processes can be intertwined, such that co-creation actions might take place in the middle of or even*

before activities in the provider sphere." Thus, co-creation can occur even before activities in the provider sphere take place. If value creation is conceptualized in this way, SL is based on value creation and is customer-centric (Grönroos and Gummerus 2014). In a more recent publication, foundational premise, *"service is the basis of all business,"* is criticized (Grönroos and Gummerus 2014). The authors claim that for all parties, service is less fundamental than value creation. Value creation is influenced by factors such as long-term costs and other sacrifices. Thus, in terms of SL, the basis of business is represented by value creation. In this case, service is only a facilitator (Grönroos and Ravald 2011).

However, Grönroos and Gummerus (2014) emphasize that many fundamental points of SL and S-D logic are similar. Even if the definitions vary to some degree, the meaning of "service" in SL and S-D logic is essentially the same. Grönroos and Gummerus (2014) argue that the starting point of both SL and S-D logic is the employment of resources in personalized physical, mental, or virtual practices by customers (any actor or beneficiary) as services that provide value for them. The customers also integrate acquired resources with resources that already exist while applying one's current knowledge and skills. Grönroos and Gummerus (2014) continue by saying that two more similarities of SL and S-D logic arise from the opportunity to use all resources as a service. Resources are integrated by use or consumption, and goods or other resources represent a means for realizing service. Through the interaction between provider, customer, and context, these resources become resources required to support the customer in practice. Both SL and S-D logic build on the recognition that actor-to-actor interactions are important for service (Grönroos 1978; Grönroos 2011; Vargo and Lusch 2011). Both also agree that value can be co-created in every phase of the service (Grönroos and Gummerus 2014; Vargo and Lusch 2016). Lastly, both use the customer-oriented and relational service perspective.

A recent argument has been that there is no more significant difference between S-D logic and SL; the major differences regarding value co-creation seem to have been overcome (Grönroos and Gummerus 2014), as the lines between each sphere are more blurry than the SL concept by Grönroos (2006) initially suggested. However, because services are highly co-created, productivity is important to improve service. Therefore, this thesis also investigates service productivity. The thesis is also part of a research project whose aim is to improve the service productivity of learning services through service engineering.

This thesis is inspired by the definition of service (SL) by Grönroos and Gummerus (2014), as Grönroos and Ojasalo (2004) also investigate in the definition of a service productivity model. The service productivity model is utilized to understand the productivity of corporate training services and, thus, the collaboration between the actors and the value of the beneficiary, in order to be able to improve the processes.

A measure of productivity is conventionally related to the application of resources (input) in a transformation (process) to create goods (output) (Vargo and Lusch 2004). In contrast, the service productivity measure describes an equal relation, with value as the output, which is generated in cooperation with customers (Grönroos and Ojasalo 2004; Parasuraman 2010). In this case, the input as well as the output quality depends on the process, and the factors are largely heterogeneous (Baumgärtner and Bienzeisler 2006). On the other side, the traditional productivity measure is characterized by an input as well as an output quality that is largely constant, and the factors are relatively homogeneous (Baumgärtner and Bienzeisler 2006).

Finally, traditional productivity measures assume that minimizing inputs with constant outputs and a given quality increases productivity. However, since the definition of a single service unit is not easy, and a variation of input factors leads to a changed perceived quality for the customer, the assumption of a given quality is not applicable to service (Grönroos and Ojasalo 2004). Until now, no widely accepted service productivity model has been available, even though it would be highly relevant improving service sector productivity (Baumgärtner and Bienzeisler 2006). To face these differences, Grönroos and Ojasalo (2004) consider service productivity as a function with several determinants. The service process is divided into three sub-processes: (1) the back office, (2) the service encounter, and (3) customer self-service (cf. figure 1).

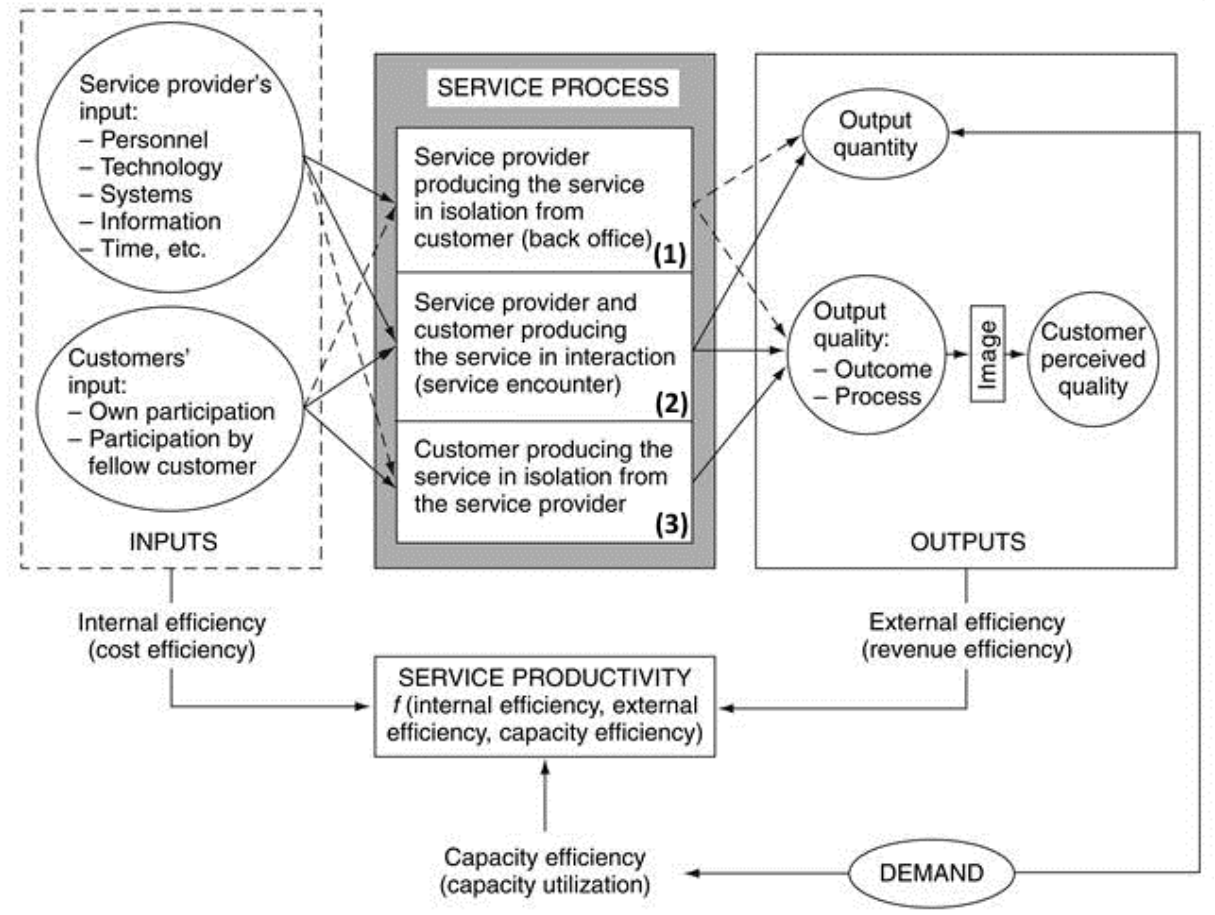

Figure 1: Service productivity model by Grönroos and Ojasalo (2004, p. 418)

In (1) the back-office sub-process, the service provider produces the service without the customer. In sub-process (2), the service encounter, providers and customers directly interact to produce the service. The customer produces the service through sub-process (3), customer self-service, based on the existing infrastructure and isolated from the provider. The service provider directly influences the (1) back office as well as the (2) service encounter sub-processes and indirectly influences the (3) customer self-service sub-process through inputs. The customer indirectly influences the (1) back office sub-process and directly influences the (2) service encounter and the (3) customer self-service sub-processes through inputs. Accordingly, the internal efficiency (cost efficiency) of the organization is determined through the combination of the service provider and customer inputs. Moreover, it describes the efficiency of the transformation of service provider and customer inputs into outputs of the service.

In the context of productivity measurement, the considered outputs are output quality and output quantity. The output quantity depends on customer demand and has an impact on the

capacity efficiency; this describes the efficiency of the production capacity, based on utilization by the customers. The capacity efficiency decreases with a supply surplus. Furthermore, the customer's perceived quality of service could have a negative impact on excess demand. The output quality is determined by the interaction of provider and customer (service process) as well as by the service output for the customer. The customer's perceived quality is the result of the output quality and the customer's impression of the service provider (image). The external efficiency of the organization is determined by these two output types and is a measure of achieving and improving the customer's perceived quality based on a given number of input factors required to produce the service.

The service productivity is a result of the internal efficiency, external efficiency, and capacity efficiency. Thus, service productivity is determined by the balance with which the provider can direct the cost efficiency of the internal structures and resources to the customer-perceived quality and the capacity utilization. This shows that in terms of service improvement, it is important to consider the customer-perceived quality, as it has an impact on the service output. The customer-perceived quality is determined by the service outcome and service process. Hence, to improve the service output, it is necessary to understand the service outcome and service process. In this thesis, service productivity is defined analogously to the definition of Grönroos and Ojasalo (2004), because this enables researchers to define, analyze, and measure productivity from a service-dominant perspective.

In the IS discipline, "service" is a key driver (Böhmann et al. 2014; Buhl et al. 2008; Leimeister 2012; Rai and Sambamurthy 2006; Satzger et al. 2010). According to Böhmann et al. (2014), value creation is determined by cooperation and contextualization; these are information-intensive aspects of value creation, as they are particularly based on information exchange (Karmarkar 2004; Lusch et al. 2007). This exchange is strongly influenced by IS. Thus, Böhmann et al. (2014) define service systems as sociotechnical systems that are geared toward a value proposition, which enables interactive value creation. To design service systems, an understanding is required of individual values and different stakeholder perspectives. As sociotechnical systems, service systems are configurations of humans, technologies, information, and organizations that create and deliver value to all actors in the system (Maglio et al. 2015). In summary, it is important to understand the service system in addition to service productivity in order to improve the productivity of a service through IT.

In the next section, the service productivity and service system of corporate training services are discussed in detail.

2.2 Corporate Training Service, Transfer-of-Training, and Technology-Enhanced Learning

Japanese management practices in the 1980s indicated that organizational success was related to having well-trained employees (Brown and Read 1984). The global competition, product/service market changes, changing customer expectations, and the new technology have caused organizations to enhance their employee training (Goodwin et al. 1999; Yadapadithaya and Stewart 2003).

Training in organizations has many purposes, such as leadership development (Ladyshewsky 2007), the use of computer systems (Hasan 2006), the orienting of new employees to organizational culture (Akdere and Schmidt 2007), understanding of new job responsibilities (Anderson et al. 1994), and an understanding of business ethics (Weber 2007). Research has gathered support for many benefits of training for individuals, teams, and organizations. These benefits include performance as well as variables that are related directly or indirectly to performance. In terms of improved organizational performance, for example, profitability, productivity, and effectiveness are included as benefits (Aguinis and Kraiger 2009). Investments in training mainly have strategic significance (Li et al. 2006), which is supported by the awareness of an organization that training improves global competitiveness (Noe 2010). In order to maintain organizations' competitive advantage, training can be critical (Birdi et al. 2008).

Training is a set of well-defined actions undertaken to achieve predetermined goals (Skinner 1968), or more precisely, is an organized, systematic series of activities designed to enhance an individual's work-related knowledge, skills, and understanding or motivation (Goetsch and Davis 2010). To improve organizational performance through training, participants must generalize learnings and apply them back in the work context. Only actions that are consciously planned and targeted are included (Berthel and Becker 2007). The activities are carried out and/or arranged and funded by the organization (Pawlowsky and Bäumer 1996). The training activities may take place in a location separate from the work context (Frankhauser 2005); frequently, training is only suitable in cooperation with service providers, because the effort to produce internal training is far too difficult (Weingärtner

1995). In particular, high-tech organizations primarily employing knowledge workers face problems of limited resources in providing all identified training needs of the organization for their employees (Knoke and Janowiec-Kurle 1999).

Moreover, studies reveal that organizations benefit from providing training through positive job attitudes, good business performance, and improved training effectiveness (Inn et al. 2010; Tharenou et al. 2007). The involvement of the customer as the participant or contracting entity in the corporate training service domain is considerable, because the service is tailored toward the specific needs of the organization. To ensure that the service meets the level of knowledge as well as the specific needs of the participants, it is necessary to integrate the customer thoroughly. Developing such highly customized services requires that the customer co-create during the development process, sharing his or her knowledge and skills with the service provider. Co-creation can also be seen during the delivery of the service, because it is influenced by the participants' behavior and the dynamics between the stakeholders.

However, a systematic corporate training service requires a structured conceptual design. The consideration of the conceptual design can take place through phases that describe the process and the action fields of the corporate training service. According to Berthel and Becker (2007) four different phases are appropriate: *analysis*, *planning*, *implementation,* and *evaluation*. In the *analysis* phase, the training needs of the organization are determined, according to the characteristics and constraints of the employees and their work contexts. The subsequent *planning* phase prepares the training, based on the present training needs. The objectives, content, and methods must be coordinated with each other and with respect to the needs and the targeted participants. The actual training takes place in the *implementation* phase, which can be designed in different ways. During the implementation phase, the contents and methods of the training service should be learned and implemented successfully in the work context. At the end of this phase, especially after face-to-face courses, a follow up is conducted in which participants ask trainers further questions about the implementation of the training content. Finally, the training service terminates with an *evaluation* phase, where the input, process, output, and concept of the training are reviewed (Becker 2006; Sonntag and Battmann 2006). As a holistic view on the training service, the evaluation phase includes a formative and a summative evaluation. In the formative evaluation, the individual satisfaction

of the stakeholders is evaluated, and in the summative evaluation, the return on training, for example, enhanced performance on the job, is evaluated (Barrett and Hovels 1998). For corporate training service providers, it is necessary to support the customer in every phase of the training.

Corresponding to the deep integration of the customer in corporate training services (Hoberg 2012), the concept of co-creation as a major part of SL is important (Grönroos 2008). The understanding of the customer as a substantial part of the value creation is emphasized by the value-in-use view (Edvardsson et al. 2011; Spohrer et al. 2008). From this point of view, the customer is able to adjust the good or service according to their needs, which results in an enhanced customer-perceived value (Kristensson et al. 2008). Additionally this leads to a closer relationship between the service provider and customer, since the customer is involved in the entire process of value creation (Babb and Keith 2011; Jaworski and Kohli 2006). This further implies the participation of the customer in the value creation with respect to value-creating activities of the service, for example, by providing specific knowledge (Gustafsson et al. 2011). This specific knowledge and the collaboration between the actors are indispensable in order to transfer learnings following a corporate training to the work context (Grossman and Salas 2011).

In the context of training, three different levels of meaning and usage of the term “transfer” are distinguished (Gräsel 2010; Hense and Mandl 2011). These are the *micro*, *macro*, and *meso* levels. On the *micro*-level, transfer is conceived as a cognitive-psychological problem (Singley and Anderson 1989). The fundamental question is whether and under which conditions new learnings can be transferred. How pedagogic innovations can be transferred or extended to further application contexts is the focus on the *macro*-level (Hense and Mandl 2011). Finally, the focus on the *meso*-level is the transfer of new learnings from the learning context into the application context. Thus, questions about the design of the learning and the functional field are of interest (Mandl et al. 1991). Translating knowledge from one context into a new context is a common focus of all levels. The focus of this thesis is on the *meso*-level of transfer, as participants in corporate training services must transfer the learnings of training to the work context (application), so organizations will benefit from their investments.

Transfer is also distinguished into the generalizability dimensions *near transfer* and *far transfer*. According to Laker (1990), these dimensions express the extent to which the content and structure of the source and target context are different. Transfer is generally more successful the more similar content and structure of the source and target context are. Thus, this thesis mainly investigates near transfer.

A further distinction of transfer relates to the influence of the previously learned new tasks or job performance. *Positive transfer* occurs if learnings are applied in the intended sense or if it improves job performance, *negative transfer* if learnings hinder the execution of new tasks or decreases job performance, and *zero transfer* if learnings have no influence on the execution of tasks or the job performance (Curry et al. 1994). *Positive transfer* is often further distinguished as *horizontal* and *vertical transfer* (Foxon 1987). In the case of *horizontal* transfer, the application of learnings is limited to one functional context. In the case of *vertical* transfer, a further competency acquisition takes place, which enables the application of learnings to a higher level and to more complex functional contexts.

Research into transfer-of-training is an interdisciplinary research field influenced by different academic disciplines, such as training, management, human resource development, or psychology (Burke and Hutchins 2007). The history of transfer-of-training research extends back more than 100 years (Blume et al. 2010). In 1901, Thorndike and Woodworth (1901) developed the theory of identical elements, one of the most famous classical transfer-of-training theories. This behavioristic theory postulates that transfer-of-training takes place if the perceptual and behavioral elements in the learning context coincide with those in the functional context. The research results also reveal that even if a participant has good grades in a test, the participant is not necessarily able to transfer his or her learnings into a new scenario. Hence, it is not sufficient to consider training as effective if participants simply learned the training content itself (Bransford and Schwartz 1999).

In response to this, Kirkpatrick (1967) published the Four-Level Model for the evaluation of training programs which is still widely used in research and practice (Kirkpatrick 1967; Mathieu et al. 1992; Van Buren and Erskine 2002). The four levels of evaluation are (Kirkpatrick 1998):

- Level 1 (reaction): *Were the participants pleased with the program?* The focus on the reaction level is on the participants and their subjective valuation of the service, e.g., satisfaction with the trainer, content, the use of media, and the infrastructure.
- Level 2 (learning): *What did the participants learn in the program?* The learning level is utilized to measure the acquisition of knowledge and skills as well as changes in the attitudes of participants through test scores.
- Level 3 (behavior): *Did the participants change their behavior based on what was learned?* Changes in the participants' behavior in their jobs are considered here.
- Level 4 (results): *Did the change in behavior positively affect the organization?* The results level represents indirect effects on the customer's business value and is linked to level three.

The Four-Level model has been criticized by Noe and Schmitt (1986) for viewing the training results as depending only on the participant, neglecting motivation and situation factors. Noe and Schmitt (1986) hypothesized that training effectiveness is not exclusively dependent on participant skills, and they developed a different model, which also considered motivational and situational factors.

Inspired by Noe and Schmitt (1986), Baldwin and Ford (1988) were the first researchers who systematically analyzed and summarized the research results on transfer-of-training spanning the period from 1907 to 1987. The aim was to summarize key findings related to the connection of training input and transfer-of-training, to criticize the existing transfer-of-training research, and to suggest possible research directions for the future. Thus, Baldwin and Ford (1988) defined positive transfer-of-training in concordance with Newstrom (1984) and Wexley and Latham (1981) as the "*degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job*" (Baldwin and Ford 1988, p. 63). To establish a common understanding of transfer-of-training and thus, to establish an environment in which transfer-of-training can be explored, they developed a model of the transfer process. This model is the basis for the growing research on transfer-of-training and is the most citied model in the research field (Brown and Sitzmann 2011). Moreover, it filled a research gap that no other model developed at that time. The model describes *training inputs*, *training outputs*, and *transfer conditions* of transfer-of-training (cf. figure 2).

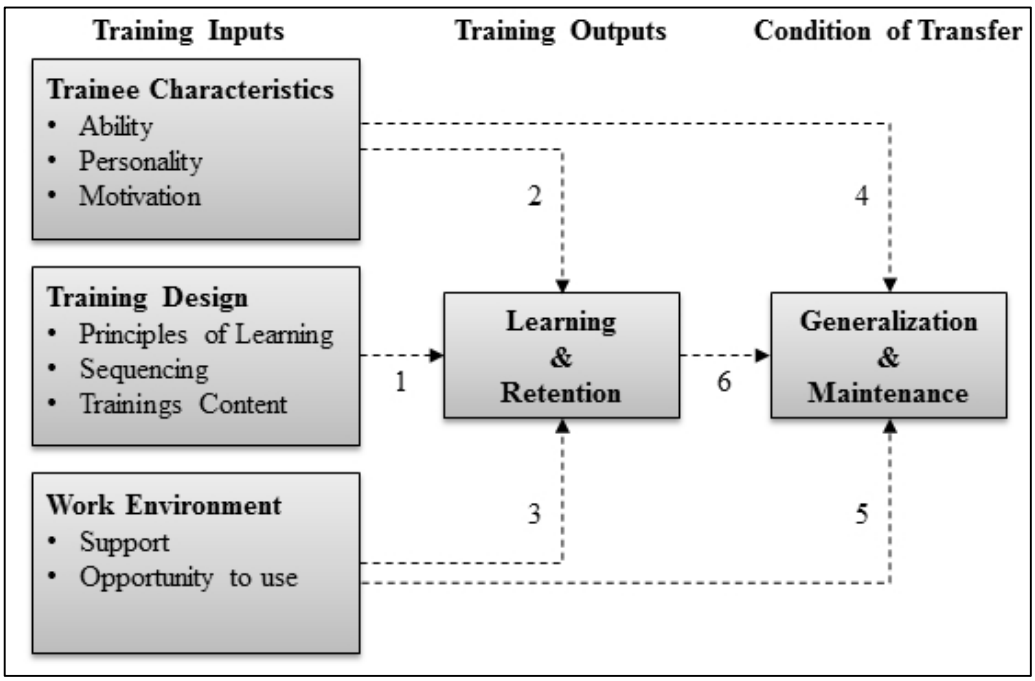

Figure 2: Transfer-of-training model by Baldwin and Ford (1988)

According to this transfer-of-training model (cf. figure 2), successful transfer occurs through the *generalization* of learnings from the training to the application context as well as their *maintenance* over time. The output of the training is the *learning and retention* of the things to be learned. Training output depends on three key determinants, namely, *trainee characteristics*, *training design,* and *work environment*. Each determinant involves a series of factors.

As shown in figure 2, the *training outputs* and *training inputs* have both a direct and an indirect effect on the *generalization and maintenance*. These effects are illustrated by six linkages and are decisive to understanding the model (Baldwin and Ford 1988). The *generalization and maintenance* of skills are affected by *training inputs* both directly (4, 5), and indirectly (6). *Learning and retention* (training outputs) affect the *generalization and maintenance* directly (6), because a participant has to learn the training content and retain the learned skills and knowledge (Kirkpatrick 1967).

The *trainee characteristics* have direct effects on *generalization and maintenance* (4), since a participant might learn and retain but then may not be motivated to transfer the learnings (Chiaburu and Marinova 2005). The *work environment* also directly affects the *generalization and maintenance* (5). For example, a participant learns and retains the training insights but

does not have the opportunity to use the knowledge and skills in the work context (Burke and Hutchins 2007). All *training input* determinants influence *learning and retention* directly (1, 2, and 3). The determinant of *trainee characteristics* influences *learning and retention* directly (2), as participants must have the ability and motivation to learn the training content. The *training design* as well has direct effects on the *training output* (1). In contrast to the other determinants, the factors of the *training design* are not applicable to any training setting. The training provider must design the content and the sequencing of the training with the contextual audience and training needs in mind (Blume et al. 2010). Finally, the *work environment* determinant directly influences the *learning and retention* (3). Support (e.g., by supervisors or peers) is considered as a important factor of transfer-of-training; for example, supervisors could identify scenarios in which to apply learnings (Brinkerhoff and Montesino 1995). In addition, participants need sufficient opportunities to use new skills and knowledge on the job, because only if enough time and resources are available to learn is a participant able to learn and retain the training content (Noe and Schmitt 1986). As stated by Baldwin and Ford (1988), there was not much research concerning the work environment determinant in the literature, except the studies by Baumgartel and colleagues (Baumgartel and Jeanpierre 1972; Baumgartel et al. 1984).

The advantage of the transfer-of-training model (Baldwin and Ford 1988) lies in its clear structure and comprehensible representation of transfer-or-training complexity. Furthermore, the determinants of the transfer-of-training process that are integrated into the model are based on empirical evidence. The model of Baldwin and Ford (1988) is still widely used in transfer-of-training research and is the basis for a large number of empirical studies in the research field (Cheng and Ho 2001). In the 1990s, the number of empirical transfer-of-training studies considerably increased. These studies were primarily based on the transfer-of-training model of Baldwin and Ford (1988) as well as on the research of Noe and Schmitt (1986) and examined or extended their postulated factors (Ford and Weissbein 1997; Grossman and Salas 2011).

Since the turn of the millennium, many researchers have summarized the progress of qualitative and/or quantitative transfer-of-training research (Baldwin et al. 2009; Blume et al. 2010; Burke and Hutchins 2007; Cheng and Hampson 2008; Cheng and Ho 2001; Russ-Eft 2002). Although the transfer-of-training model by Baldwin and Ford (1988) has been updated and extended by other researchers (Burke and Hutchins 2008; Ford and Weissbein 1997), the

focus has remained on the determinants: *trainee characteristics*, *training design*, and *work environment*. A slight alignment of the transfer-of-training determinants' taxonomy was proposed by Burke and Hutchins (2007) to *learner characteristics*, *intervention design*, and *work environment*, as research continued to fall within the three broad categories of the individual, intervention, and environmental factors. However, final conclusions about the key factors of the three transfer-of-training determinants remain ambivalent, and there are few empirical syntheses (Blume et al. 2010; Grossman and Salas 2011). Therefore, this thesis conducts a literature review that identifies empirically proven key factors of the three transfer-of-training determinants.

Saks and Burke (2012) investigated the relationship between transfer-of-training and training evaluation. This study was the first to demonstrate that training evaluation positively influences transfer-of-training. Immediately after training, the relationship between training evaluation and transfer-of-training is stronger than at six months or at one year after training. Finally, in terms of accountability, the study reveals that the training evaluation of behavior and results is important. Thus, the intervention design in this thesis includes a training evaluation that was announced at the start of the training to improve transfer-of-training.

According to a survey of the American Society for Training and Development (2012), the use of technology-driven corporate training by companies is steadily increasing. About 75% of technology-driven training in 2004 was at least partially online (Sugrue and Rivera 2005). In 2012, corporate training providers spent the highest portion of their budgets on tools and technology for their services (Bradstreet 2012). Hence, the driving force of corporate training services is technology. Traditional approaches to corporate training focus on instructional learning in a classroom. However, the traditional approach has shortcomings, because participants in the training are not motivated enough to learn actively (Bates 2000).

An opportunity to increase the motivation is given by IT to enable participants to independently follow up learning content using e-learning arrangements (McCormack and Jones 1997). E-learning refers to training that is instructed and delivered online through the Web (Rosenberg 2001). Because of high retention and dropout rates, today, corporate training providers focus on communication, collaboration, and interactive face-to-face scenarios (Hoic-Bozic et al. 2009). The combination of e-learning and face-to-face learning advantages

promote better learning effects (Bates 2005); this combination is widely known by the term "blended learning" (Kerres and Witt 2003; Saks and Burke-Smalley 2014).

LMS have become a default as blended learning has been widely adopted (McCormack and Jones 1997), and they are indispensable tools for corporate training (Bradstreet 2012). But there are some obvious problems using LMS in corporate training services. Content, communication, and transfer of content along with the transfer processes themselves are difficult for users to link within LMS, due to the infinite number of separate functions provided by LMS for an infinite number of use cases. LMS are not designed to improve the transfer-of-training output; rather, they are systems used to manage the training attended by participants, to provide training content to participants, and to provide a communication tool (Semmann et al. 2012). Hence, the resulting artifact of this thesis extends the capabilities of LMS and is utilized as the main technology artifact of the corporate training service system.

In sum, transfer-of-training is the major outcome of corporate training services. The transfer-of-training outcome is characterized by how participants apply of what they learned in the training to the job as well as by the resulting improvements of organizational performance. So far, IT has not been used to address improving this outcome of corporate training services. However, the use of IT for this purpose is promising. For example, IT can be used to engage supervisors and peers of training participants in facilitating transfer-of-training. IT can thus become a conduit for transfer-supporting value co-creation processes in corporate training services. From this perspective, IT can be leveraged to improve the outcome of corporate training services and thus contribute to service productivity.

2.3 Research Goals and Research Questions

This thesis focuses on transfer-of-training and corporate training services. Because of the substantial transfer-of-training output problem of these training services, this thesis centers on the design and evaluation of transfer-supporting IT components that enable the facilitation of improvements in the productivity of corporate training services by strengthening the transfer-of-training output. Thus, the overall research aim is …

> ***… to improve the transfer-of-training output of corporate training services through IT.***

Several stages must be gone through to achieve this goal. The initial stage is to analyze the current situation with respect to corporate training services. This analysis uncovers productivity problems in these services as well as promising research directions, thus motivating this research. Important parts of this research have been published in Amrou et al. (2013). For the initial stage, the research question (RQ) is:

> **RQ1:** ***What are the current limitations to improve the transfer-of-training output of corporate training services through IT support?***

In accordance with the identified research gaps and research motivation, the next stage is to derive requirements for transfer-supporting IT components. These requirements are based on training research and are inspired by service logic. They represent theoretical and practical objectives that the transfer-supporting IT components must fulfill. Important parts of this research have been published in Amrou et al. (2013) and Amrou et al. (2015), answering the following research question:

> **RQ2:** ***Which requirements should transfer-supporting IT components fulfill to improve the transfer-of-training output of corporate training services?***

Based on these objectives, a novel solution to improving the transfer-of-training output of corporate training services must be developed. Guided by the theory of transfer-of-training and inspired by service logic, the development follows an iterative search for the design as well as the utilization of the transfer-supporting IT components. The first three iterations have been published in Amrou et al. (2015), and the subsequent two iterations in Amrou and Böhmann (2016). This research answers the following research question:

> **RQ3:** ***How must transfer-supporting IT components be designed and utilized to improve the transfer-of-training output of corporate training services?***

Finally, the instantiation of the transfer-supporting IT components and their utilization in corporate training services must be assessed. This evaluation compares the objectives of the

transfer-supporting IT components to actual observed results from use in a demonstration (Peffers et al. 2007). The evaluation helps to gain comprehensive insight into the user acceptance and the effectiveness as well as usability of the components. A proof-of-concept for the *demonstration* of the use of the transfer-supporting IT components has been published in Amrou et al. (2015). The extent to which the transfer-supporting IT components are superior to common IT solutions in terms of transfer-of-training determinants has also been published in Amrou and Böhmann (2015). A further demonstration of use and a naturalistic evaluation with real people, a real system, and a real problem have been published in Amrou and Böhmann (2016). The research question for the final stage is the following:

> **RQ4:** ***Do transfer-supporting IT components improve the transfer-of-training output of corporate training services?***

These research questions are the basis upon which this thesis has been conducted. In the following section, the research design of this thesis is described.

3 Research Design

The research design of this thesis is introduced in this chapter. A research design defines the research strategy of the thesis, and the application of the research strategy allows the answering of the research questions. To ensure the intersubjectivity and comprehensibility of the research process, details of the research process are discussed. The first section introduces details about DSR and the second section the instantiation of DSR within this thesis.

3.1 Design Science Research Paradigm

IS research is divided into the research paradigms of (1) behavioral science and (2) design science (Hevner et al. 2004; March and Smith 1995). Paradigm (1) is rooted in natural science research behavioral science and explains human or organizational behavior. Paradigm (2), design science, focuses on the acquisition of knowledge through the design and evaluation of new artifacts (Myers 2013) and has a long history in many areas such as engineering, education, and psychology (Cross 2001).

IS scholars and professionals are particularly engaged in the development of innovative IT artifacts designed to improve organizational performance. Thus, DSR is an important paradigm of IS research (March and Storey 2008). DSR is rooted in engineering as well as the sciences of the artificial and is a problem-solving paradigm. It contains the discourse about the pragmatic creation process of artifacts with predefined properties to solve real-life problems (Hevner et al. 2004). Building and evaluating artifacts are the main design processes of DSR; these may result in constructs, models, methods, or instantiations. These artifacts directly influence research as well as practice by providing solutions for identified organizational problems (March and Smith 1995). The general acceptance of DSR as a legitimate approach in IS research has been increasing since its introduction in the field (Hevner and Chatterjee 2010; Kuechler and Vaishnavi 2008).

Seven guidelines are proposed by Hevner et al. (2004) to conduct high-quality DSR. These guidelines are paraphrased as follows:

1. The result of DSR is a purposeful IT artifact (construct, model, method, or instantiation) that solves an important organizational problem.

2. The result of the DSR must be relevant and important to the identified organizational problem.
3. The utility, quality, and efficacy of a DSR result must be demonstrated and evaluated.
4. Results of a DSR must make a clear contribution, such as the artefact itself, methodologies, or foundations.
5. In any activity of the DSR, the research must be rigorous, mainly through the application of rigorous methods.
6. To achieve better results for the important and relevant problem, DSR is conducted iteratively.
7. The DSR must be adequately communicated to directly influence research and practice. Technology and management are preferred audiences.

According to Hevner and Chatterjee (2010), the DSRM by Peffers et al. (2007) provides a useful synthesized general model that builds on existing approaches and is compatible with the underlying ontological perspective of DSR. The DSRM is a widely accepted and applied methodology that provides a nominal process by which to conduct DSR and which serves as a mental model or template to structure the research output (cf. figure 3).

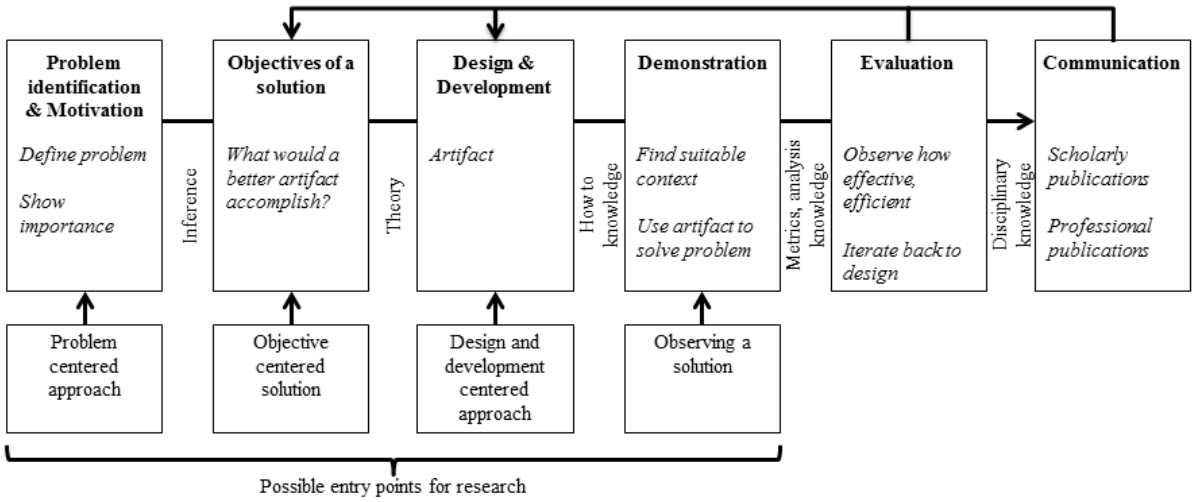

Figure 3: Design Science Research Methodology by Peffers et al. (2007, p. 54)

As proposed by Peffers et al. (2007) and shown in figure 3, the DSRM can be initiated though four different entry points, depending on the progress of the problem or solution: *problem centered approach*, *objective centered solution*, *design and development centered approach*, and *observing a solution*.

According to Peffers et al. (2007), the first activity of the DSRM is the *problem identification and motivation,* which requires researchers to define the specific research problem and justify the solution that solves the problem. Within the second activity, researchers must *define the objectives of a solution,* which are deduced from the problem definition as well as the knowledge of what is possible and feasible. Subsequently, the *design and development* activity requires the researcher to determine the functionalities as well as the architecture, and finally, to create the actual artifact. The use of the developed artifact to solve the problem must be conducted in the *demonstration* activity. Next, the *evaluation* activity, which is a decisive activity in DSR (March and Smith 1995), requires researchers to compare the objectives of a solution of the artifact to the observed results from using it in the *demonstration* activity. Finally, in the *communication* activity, the researcher should submit the results to appropriate researchers and relevant audiences. The DSRM is an iterative process by which to design artifacts. Within this process, evaluation and communication activities can initiate iterations that result in modified artifacts.

3.2 Application of Research Methodology, Theories and Frameworks

To design the artifacts, this thesis follows the DSR paradigm of Hevner et al. (2004). The final design artifact of this thesis is an instantiation as well as an adapted training method that integrates the instantiation into a corporate training service (March and Smith 1995). To iteratively design and develop the artifacts, DSRM by Peffers et al. (2007) is adopted (cf. figure 4).

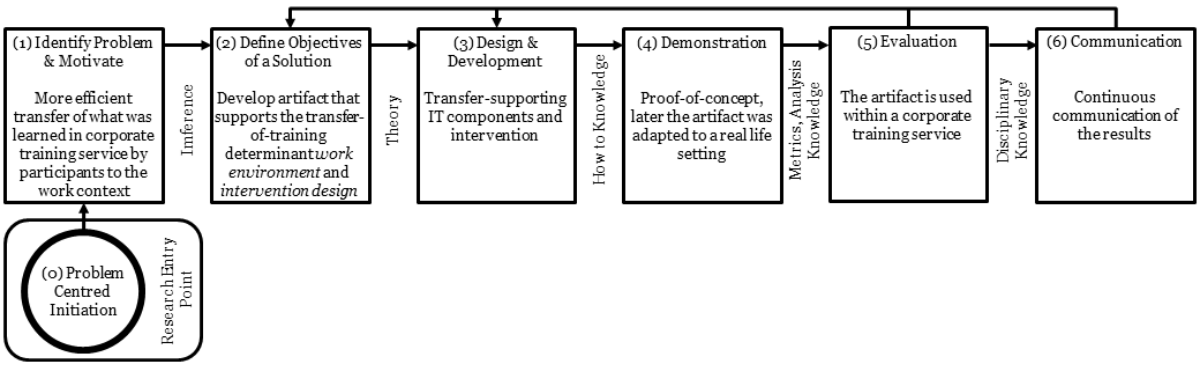

Figure 4: Adapted DSRM of Peffers et al. (2007, p. 54), published in Amrou and Böhmann (2016, p. 2)

As the DSRM is an iterative process, and *evaluation* as well as *communication* activities can initiate iterations, this cumulative thesis was built on five iterations and four publications (cf. table 2).

Author (year)	**Iteration: Objective source**	**Design type**	**Demonstration type**	**Evaluation type / Data acquisition**	**Answered Research Questions**
Amrou et al. (2013)	1: Theory V1	Conceptual Model V1	Proof-of-concept with experts	Artificial / In-depth interviews	RQ1 and RQ2
Amrou and Böhmann (2015); Amrou et al. (2015)	2: Theory V1 & Practical V1	Conceptual Model V2	Proof-of-concept with experts	Artificial / In-depth interviews	RQ2, RQ3, and RQ4
	3: Theory V1 & Practical V2	Instantiation V1	Proof-of-concept with experts and end users	Artificial / In-depth interviews	
	4: Theory V1 & Practical V3	Instantiation V2	Proof-of-concept with experts and end users & theoretical proof-of-concept	Artificial / In-depth interviews	
Amrou and Böhmann (2016)	5: Theory V2 & Practical V4	Instantiation V3	Proof-of-concept with experts and end users & use in real life setting	Naturalistic / In-depth interviews & analysis of use	RQ3 and RQ4

Table 2: Design iterations of this thesis adapted from Amrou and Böhmann (2016, p. 3)

In Amrou et al. (2013) the *problem centered* initiation (0, figure 4) is documented as a practical problem (1, figure 4), and theoretical foundations are identified based on a literature review. The contribution of a novel solution is also justified in the light of existing artifacts and research.

In DSR, researchers are particularly required to build on prior research to advance design knowledge. To fulfill this requirement, this thesis follows the theory-driven design of Briggs (2006) and utilizes transfer-of-training as the intended output variable and transfer-of-training determinants as theoretical guidance.

In relation to figure 4, the resulting (2) *objectives* of the solution, the (3) *design and development*, the (4) *demonstration*, and the (5) *evaluation* of the artifacts are discussed in Amrou et al. (2015) up to the fourth iteration. A proof-of-concept for the (4) *demonstration* of use and the extent to which the transfer-supporting IT components differ from existing learning solutions are also discussed in Amrou and Böhmann (2015). Guided by the FEDS proposed by Venable et al. (2016), formative evaluations are conducted in the first four iterations.

Finally, a summative naturalistic evaluation approach is chosen in iteration five with real users, a real problem, and a real system. Therefore, the artifacts are introduced to a global corporate training program for a demonstration of use and naturalistic evaluation. The final (2) definition of *objectives* of the solution, (3) *design and development*, (4) *demonstration* of use, and (5) naturalistic *evaluation* are discussed in Amrou and Böhmann (2016).

In addition to the (6) *communication* activities explained above, this cumulative thesis compromises the communication of the whole research process.

4 Publications

4.1 Related Publications

Seven publications are part of this research, directly or indirectly relating to the topic of this thesis. These are published in journals, conference proceedings, and book chapters.

Journal Article

- Zolnowski, A., Semmann, M., Amrou, S., Böhmann, T. 2013. "Identifying Opportunities for Service Productivity Improvement Using a Business Model Lens– Lessons from Corporate Education Services," *Service Industries Journal* (33:3-4), pp. 409–425. (http://www.tandfonline.com/doi/full/10.1080/02642069.2013.747516)

Conference Proceedings

- Semmann, M., Amrou, S., and Böhmann, T. 2012. "Analysis of Learning Management Systems According to a Holistic View on Corporate Education Services," in *Proceedings of SIGSVC Pre-ICIS Workshop 2012*, Orlando. (http://aisel.aisnet.org/sprouts_all/517/)

- Amrou, S., Semmann, M., and Böhmann, T. 2013. "Managing for Transfer of Training: Directions for the Evolution of Learning Management Systems," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Chicago. (http://aisel.aisnet.org/amcis2013/ISEducation/GeneralPresentations/10/)

- Amrou, S., Semmann, M., and Böhmann, T. 2015. "Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design," in *Proceedings of International Conference on Wirtschaftsinformatik.* Osnabrück. (http://aisel.aisnet.org/wi2015/14/)

- Amrou, S., and Böhmann, T. 2015. "Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Puerto Rico. (http://aisel.aisnet.org/amcis2015/ISEdu/GeneralPresentations/26/)

- Amrou, S., and Böhmann, T. 2016. "Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services," in *Proceedings of International Conference on Information Systems (ICIS)*, Dublin. (http://aisel.aisnet.org/icis2016/ISDesign/Presentations/11/)

Book Chapter

- Semmann, M., Amrou, S., and Böhmann, T. 2014. "Produktivitätsorientiertes Lern Service Engineering," in *Produktivität von Dienstleistungen*, K. Möller and W. Schultze (eds.), Springer, pp. 456–471. (http://link.springer.com/chapter/10.1007/978-3-658-04086-4_7/fulltext.html#Sec15)

4.2 Included Publications

This subsection briefly introduces the four publications that answer the research questions of this cumulative thesis (cf. table 3 – table 6).

Chapter 9: "Managing for Transfer-of-Training: Directions for the Evolution of Learning Management Systems"

Citation	Amrou, S., Semmann, M., and Böhmann, T. 2013. "Managing for Transfer of Training: Directions for the Evolution of Learning Management Systems," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Chicago.
Ranking	WKWI: B VHB-JQ: D
Type	Completed Research Paper
Aim	This publication searches for a transfer-of-training theory and determinants. Drawing from the transfer-of-training theory and determinants, the missing IT support by LMS for transfer-of-training is demonstrated.
Methodology	Literature review and conceptual research
Contribution	In this publication, the theory and determinants of transfer-of-training are identified as well as the missing IT support by LMS of transfer-of-training in corporate training services is demonstrated. It is striking that most literature on these determinants is older than a decade and does not address the potential influence of IT on these determinants. Therefore, focusing on these issues is recommended as done in this paper. Based on these determinants, requirements were derived for IT support for improving transfer-of-training output of corporate training services.
Co-authors & contribution	The article was co-authored by Martin Semmann and Prof. Dr. Tilo Böhmann. Martin Semmann helped me to identify the transfer-of-training determinants and contributed the transfer-of-training literature section. Prof. Böhmann helped me to design this paper and revised the introduction as well as the conclusion section.

Table 3: First publication of cumulative thesis

Chapter 10: "Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design"

Citation	Amrou, S., Semmann, M., and Böhmann, T. 2015. "Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design," in *Proceedings of International Conference on Wirtschaftsinformatik.* Osnabrück.
Ranking	WKWI: A VHB-JQ: C
Type	Completed Research Paper
Aim	The aim of this publication is to conceptualize transfer-supporting IT components based on a theory-driven design approach and industry requirements. Moreover, to search for an appropriate evaluation strategy and discuss the formative evaluation of the prototype.
Methodology	Conceptual research
Contribution	This publication discusses transfer-of-training as a key output of corporate training services as well as the need for collaboration between service providers and customers for improving the productivity of these services. It also presents the design and prototype of the transfer-supporting IT components that seek to improve transfer-of-training outputs with a focus on factors of the work environment determinant. Finally, the formative evaluation and the iterative development of the components are discussed.
Co-authors & contribution	The article was co-authored by Martin Semmann and Prof. Dr. Tilo Böhmann. Martin Semmann helped me to derive the concept of the transfer-supporting IT components from identified transfer-of-training determinants and contributed the very first version of the derivation section. Prof. Böhmann helped me to design this paper and revised the introduction as well as the conclusion section.

Table 4: Second publication of cumulative thesis

Chapter 11: "Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be"

Citation	Amrou, S., and Böhmann, T. 2015. "Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Puerto Rico.
Ranking	WKWI: B VHB-JQ: D
Type	Completed Research Paper
Aim	The aim of this paper was to demonstrate transfer-supporting IT components and assess the extent to which software products of learning management systems as well as project management systems support the IT-supporting functions of transfer-of-training.
Methodology	Comparative research
Contribution	The comparative evaluation contributes the extent to which identified software products of learning management systems and project management systems support transfer-of-training. Transfer-supporting IT components are utilized and demonstrated as the evaluation criteria. Inspired by the findings of the comparative evaluation research and development, opportunities for learning management systems are derived.
Co-authors & contribution	The article was co-authored by Prof. Dr. Tilo Böhmann. Prof. Böhmann helped me to design this paper. In addition, he revised the introduction and the conclusion section.

Table 5: Third publication of cumulative thesis

Chapter 12: "Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services"

Citation	Amrou, S., and Böhmann, T. 2016. "Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services," in *Proceedings of International Conference on Information Systems (ICIS)*, Dublin.
Ranking	WKWI: A VHB-JQ: A
Type	Completed Research Paper
Aim	The aim of this paper was to design and evaluate the final transfer-supporting IT components and the corresponding intervention in a naturalistic setting.
Methodology	Design Science Research
Contribution	The contribution of this paper was the final design and naturalistic evaluation of the transfer-supporting IT components and the corresponding intervention. Previous work in this area covered the initial design and formative evaluation. In this paper, a revised and extended design of the transfer-supporting IT components is presented. The naturalistic evaluation shows that the transfer-supporting IT components and a complementary IT-based intervention improves the transfer-of-training output of corporate training services. The results provide reusable design knowledge for addressing the transfer-of-training problem of corporate training services.
Co-authors & contribution	The article was co-authored by Prof. Dr. Tilo Böhmann. Prof. Böhmann helped me to design this paper. In addition, he revised the introduction, research design, and conclusion sections.

Table 6: Fourth publication of cumulative thesis

5 Theoretical Contribution

5.1 Overall Theoretical Contribution

Transfer-of-training is a core issue for training researchers, training practitioners, and organizations (Burke and Hutchins 2007). Thus, it is hardly surprising that research on transfer-of-training is growing significantly (Brown and Sitzmann 2011). Researchers of different domains have established a basement through qualitative as well as quantitative studies to shape the theory and determinants of transfer-of-training. Surprisingly, IS research has overlooked the potential of transfer-of-training on organizational performance (Amrou et al. 2013). The growing transfer-of-training knowledge as well as its importance in research and practice, the transfer-of-training potential for organizational performance, and the missing IS research on transfer-of-training motivate this thesis. Rooted in a cumulative research design, this thesis is based on and contributes to training research, service science research, and design science research. Figure 5 illustrates the tension field of this thesis.

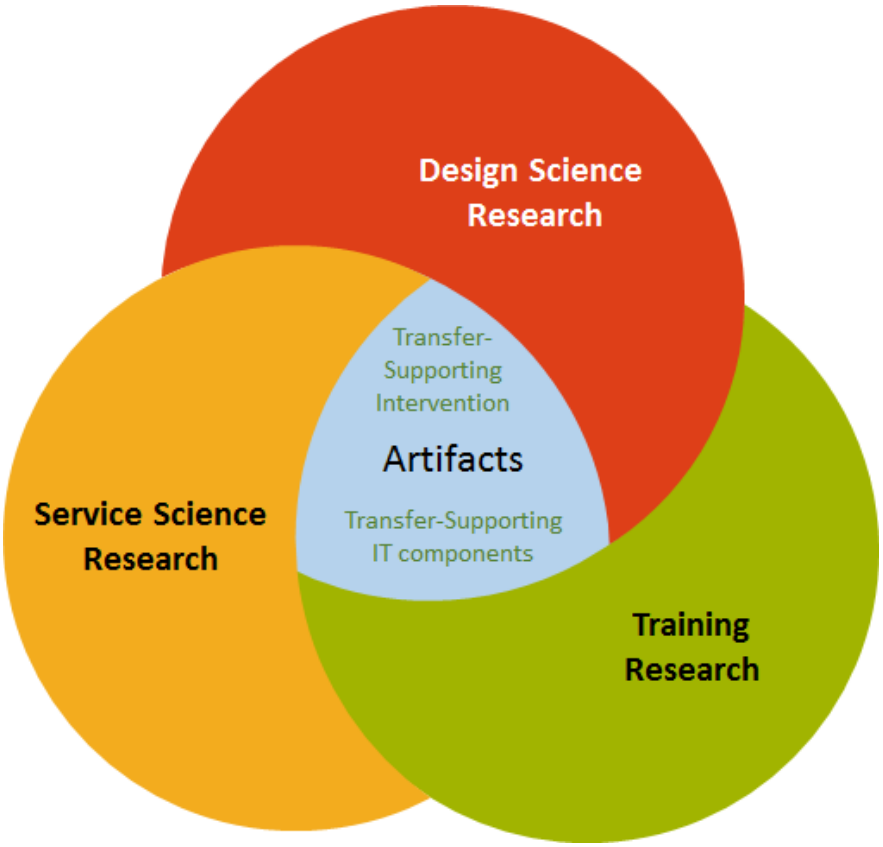

Figure 5: Tension field and contribution of this thesis

This thesis is based on several research domains in developing its contribution. Training research essentially influences the contribution of this thesis. From a theory-driven perspective, the research branches of transfer-of-training (e.g., Baldwin and Ford 1988; Blume et al. 2010) and training evaluation (e.g., Kirkpatrick 1998) are most relevant in this research field. The perspective on training in this thesis is based on the research branches of service logic (e.g., Grönroos 2008; Vargo and Lusch 2004) and service systems (e.g., Böhmann et al. 2014; Maglio et al. 2015), branches of service science research. Finally, DSR provides a research paradigm to rigorously develop a research contribution and, thus, to solve the identified organizational problem (Gregor and Hevner 2013; Hevner et al. 2004). As an instantiation of the DSR paradigm, DSRM is applied in this thesis in order to structure and organize the research process (Peffers et al. 2007). In the interweaving of these research branches, a mutually beneficial dialogue emerges. This in turn enables the exchange of sophisticated knowledge and extends the existing expertise with new additional perspectives.

5.2 Contributions to Training Research

5.2.1 Transfer-Supporting IT Components

This thesis is rooted in cumulative research and aims to improve transfer-of-training in corporate training services through IT support. Many literature reviews have been conducted to summarize the progress of qualitative and/or quantitative transfer-of-training research and known transfer-of-training determinants (Baldwin et al. 2009; Blume et al. 2010; Burke and Hutchins 2007; Cheng and Hampson 2008; Cheng and Ho 2001; Russ-Eft 2002). However, conclusions about the key factors of transfer-of-training determinants remain ambivalent, with a lack of empirical syntheses (Blume et al. 2010; Grossman and Salas 2011).

During the thesis, a literature review is conducted that identifies transfer-of-training as the kernel theory of this thesis as well as determinants of transfer-of-training. A search in relevant databases identifies 51 publications in the research domain of “human resources” as well as “pedagogy” and 79 publications in “management research” and “IS.” The first screening of the literature identifies 72 publications as relevant. Relevant publications address transfer-of-training as well as corresponding determinants and are empirically substantiated. The extensive literature review identifies 3 determinants and 15 corresponding factors that

influence transfer-of-training. A factor is added to a determinant if at least two independent empirical studies reveal an influence on transfer-of-training.

For the construction of the artifacts, the *work environment* and the *intervention design* determinants of transfer-of-training are considered. As a result, the instantiated artifacts of this thesis are based on a theory-driven design that utilizes empirically supported cause and effect relations (Briggs 2006).

Thus, this thesis proposes transfer-supporting IT components that influence transfer-of-training determinants to improve the transfer-of-training output of corporate training services. In line with the definition by Grönroos (2008), a corporate training service is an instance of a highly co-created service. Thus, training customers as well as providers must collaborate, and the training must be contextualized to meet the customers' training needs. Transfer-of-training emphasizes this need for contextualization and collaboration (Grossman and Salas 2011).

Drawing from transfer-of-training determinant *work environment*, stakeholders of corporate training services must collaborate (*supervisor and peer support* factor) with training participants to support the contextualization (*opportunity to perform* factor) of learnings within the individual work context, to facilitate the application, generalization, and maintenance of knowledge, skills, and behavior by participants on the job. To enable participants to apply, generalize, and maintain learnings from training at work, the circumstances at work must be conducive (*transfer climate* factor). Support of this service requires a responsive environment that is globally accessible as well as four components that facilitate transfer-related interventions.

The main transfer-related functionalities of the transfer-supporting IT components are aggregated in the project documentation (c.f. figure 6). As the center of the components, the project documentation facilitates the definition of improvement projects in a structured way and enforces an explication of the utility. In addition to functions, the project documentation aggregates sections to define improvement projects based on the training content and on the work context. Information about the project, such as stakeholders and the project status, are also accessible. To meet individual intervention designs, the intervention customization function provides the opportunity to configure the project documentation according to the training intervention. This thesis demonstrates the effectiveness of the transfer-supporting IT components by integrating the transfer-supporting intervention (c.f. section 5.2.2). As a

responsive web-based service, the components give ubiquitous access to all information needed and to all stakeholders of the corporate training service.

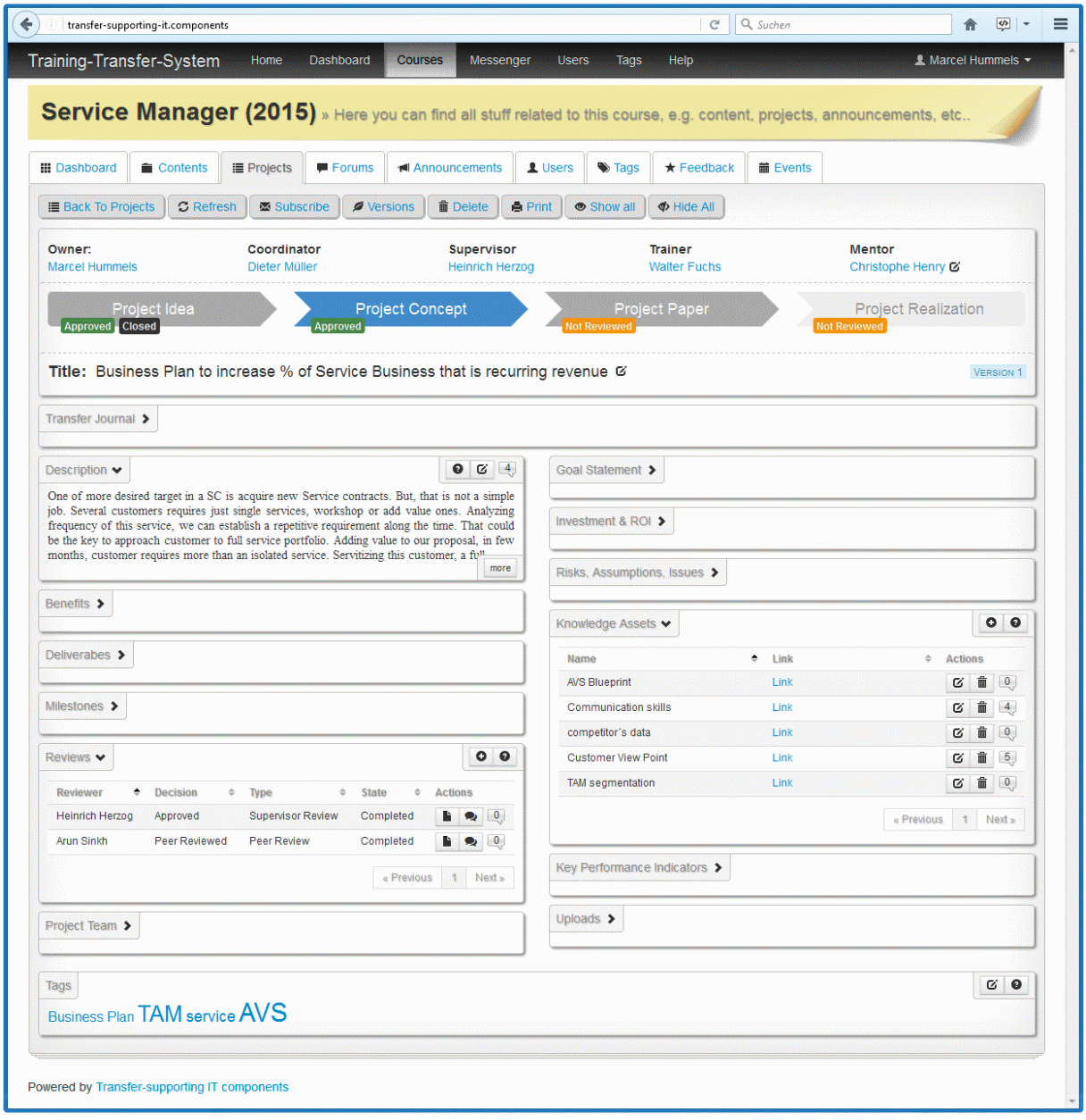

Figure 6: Project documentation screenshot of transfer-supporting IT components

The responsive web-based-service adjusts its user interface to the IT environment in which the user utilizes the components, which makes the use of the components by all stakeholders more likely (*opportunity to perform* factor). For example, it ensures the possibility of working on the project on the way, through mobile devices. The transfer-supporting IT components also facilitate the access of external stakeholders (e.g., trainers) to work-related information,

as organizations are reluctant to grant access to their infrastructure and application systems. This makes transfer-supporting IT components a powerful link between the training and the work context for all stakeholders. Therefore, the components provide different roles and corresponding permissions for training coordinators, trainers, supervisors, mentors, and training participants. In the following, the components (C1-C4) and corresponding functionalities are summarized.

Transfer Preparation (C1)

This component aims to provide participants with functions to prepare the application of learnings in the individual work context. In particular, it provides participants with a transfer journal, access to training content, and access to prior improvement projects. Both functions can be commented upon. The transfer journal provides the participant the opportunity to prepare ideas resulting from the training and to note information about training content they are particularly interested in and wish to utilize in their work setting to improve daily business in the short term. Furthermore, this component provides the opportunity to access training material to be able to learn or retain the training content following a face-to-face course. Finally, the prior project listing enables participants to find examples of prior participants applying the training content, which facilitates the application of learnings in the work context. Through this opportunity, participants can easily retrace certain knowledge and learn to apply this knowledge through the experience from prior projects.

Improvement Project Definition (C2)

This component provides functions to initiate and conceptualize work-related improvements through the application of learnings. In particular, it provides participants the opportunity to create knowledge assets, key performance indicators, and milestones and to link those to the project documentation, where further sections can be used to document the project. The project documentation enables participants to initiate and conceptualize the project, as the representation of the different sections in the project documentation facilitate the entering of information. The different sections lead to a detailed documentation of the initiation as well as the concept, and they enforce an explication of the utility. For example, deliverables and a goal statement must be defined. The knowledge assets function provides participants with the opportunity to reference further knowledge to the initiation or concept of the improvement. It also provides the opportunity to easily access training materials (*opportunity to perform*

factor). Through the KPI function, participants can summarize related KPIs that are improved through the work-related improvement and can discuss those in detail with supervisors and peers. The milestone function can be used to plan the training or plan the improvement. In addition, it signals the compliance of the time plan. The versioning system supports participants in better retrieving project documentation changes and retrieving which feedback initiated the change.

Supervisor Feedback and Support (C3)

This component provides functions to support the participants' application, generalization, and maintenance of learnings in work-related improvements. The project review and authorization function provides the opportunity for supervisors to review and approve project documentation. The authorization gives participants the mandate to implement changes in current work practices (*opportunity to perform* factor). Participants can improve the application of training insights in their improvement project through the reviews, as supervisors provide additional insights of organizational goals that can be addressed with the training content. In addition, supervisors can show the link between the goals and the specific training content. Participants are more motivated in applying training insights, because the risk of applying a training insight is shared by additional shoulders. That is, by getting reviews, the participants receive authorization enriched with valuable information regarding their improvement and the application of training content. In contrast, all other actors in the training can review but cannot approve. The level of involvement of peers is transparent and enables a high visibility to supervisors. This visibility is a strong incentive for participants to engage in peer support.

Finally, this function enables the actors to pay particularly close attention to the application of training content. The regular feedback cycle function also provides opportunities to manage, and it signals scheduled feedback activities. In particular, it allows coordinators to create regular feedback cycles by inviting actors to review. These regular cycles encourage participants to work constantly on the improvement and to provide feedback. This is a reason for all actors to interrupt daily business and work on the improvement. The intention is to encourage the commitment of supervisors, mentors, and peers as well as trainers to the improvement and thus to ensure their ongoing support. Moreover, this component provides the opportunity to all actors in the training to comment upon each content item within the

components. Consequently, this function enables critical commitment. Finally, actors can subscribe to project documentation to be notified on new feedback and can access a feedback overview that aggregates the feedback made on the related project documentation. This enhances the effectiveness of the transfer-supporting IT components.

Improvement Project Finalization (C4)

This component provides functions to document and realize improvements in the work context. In particular, it provides all actors the opportunity to track measurable improvements in a project, and participants can report the status of a project on planned timeslots. Supervisors have the opportunity to check those KPIs during the realization to review the progress. The KPI function documents the changes in KPIs. The milestone function can be used to plan the training or to plan the improvement. In addition, it signals the compliance with the time plan. Progress in terms of the development of addressed KPIs and the completion of milestones can also be tracked. This high transparency based on facts helps to explicate the value of the corporate training service. The regular traffic-light reports function also provides the opportunity to share the status of the realization on scheduled dates. The continuous writing of traffic-light reports leads to a continuous reflection by participants on their actions and on the applied training contents. Participants specify possible changes in the chosen approach through the definition of necessary activities or problems with the transfer-of-training content (*opportunity to perform* factor). Errors can be prevented or be adjusted by stakeholders. Finally, through the tracking of measurable improvements in the improvement project finalization function, the return on investment (customer) or the return on training (provider) can be tracked and evaluated. By providing measurable work-related improvements as a consequence of the corporate training service, the *transfer climate* in an organization is positively influenced.

These artifacts are subjected to multiple iterations of formative evaluations with experts and a summative evolution in an international context with a real problem, a real global system, and real people.

So far, few studies have investigated transfer-of-training in a real company setting, while numerous studies have been conducted in a student setting with a limited generalizability of the results. Besides the investigation of transfer-of-training in field studies, researchers suggest four quality criteria for studies of transfer-of-training (Cheng and Ho 2001). First,

positive transfer-of-training should not be collected by self-description, for the sake of the validity of the study. Second, for the sake of generalizability, the tasks required to apply learnings should have adequate complexity. Third, the investigation should be embedded in a theoretical framework. Finally, factors of the *work environment* should be included in the study. However, this thesis considers all criteria suggested. A mixed methodology is used for the data acquisition in the summative evaluation (Greene et al. 1989), which involves participant observation, interviews (qualitative), and data on the use of the transfer-supporting IT components (quantitative).

The naturalistic evaluation of the artifacts and the predominately positive perceived effect on service quality and training output lends support to the utilized factors of the *work environment* and *intervention design* determinants of transfer-of-training. The number of successfully completed improvement projects and transferred insights emphasize the positive influence on transfer-of-training through the factors of *opportunity to perform*, *peer support*, *supervisor support*, and *practice and feedback*. The summative evaluation particularly shows the strong perceived effectiveness of the transfer preparation component (C1) and the supervisor and peer support component (C4).

Component C1 predominantly influences the *opportunity to perform* factor of the work environment determinant of transfer-of-training. The component also provide participants the possibility of capturing and carrying what was learned to the work context (*opportunity to perform*) by guiding participants to specific improvement projects. However, participants predominantly perceive the training output of the improvement project as positive. Hence, this thesis reveals, in line with other research (e.g., Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006), that the *opportunity to perform* positively influences transfer-of-training.

Component C4 predominantly influences the *supervisor and peer support* factors of the work environment determinant of transfer-of-training. This component helps to elicit and communicate the support of managers (*supervisor support*). Likewise, the component facilitates support in projects by the peer group of the participants (*peer support*). The summative evaluation clearly reveals that supervisor support positively influences transfer-of-training. Peer support also positively influences the transfer-of-training, but in contrast to supervisor support, the peer might not thus far have adequate knowledge and skills to support

the participant. However, this thesis, in line with other research, demonstrates a positive effect on transfer-of-training by supervisor support (e.g., Brinkerhoff and Montesino 1995; Broad and Newstrom 1992; Burke and Baldwin 1999; Clarke 2002; Lim and Johnson 2002; McSherry and Taylor 1994) and peer support (e.g., Chiaburu and Marinova 2005; Facteau et al. 1995).

In summary, the transfer-supporting IT components address the *work environment* and the *intervention design* determinants of transfer-of-training. The components also support the co-creation of value by fostering the interaction between training participants, stakeholders, and training professionals. The results of this thesis provide reusable design knowledge for addressing the transfer-of-training problem of corporate training services. To the best of my knowledge, this thesis is the first to propose an instantiation and to provide evidence-supported design knowledge for transfer-supporting IT components.

5.2.2 Transfer-Supporting Intervention

This thesis contributes an intervention design to the transfer-of-training branch of the training research domain. The transfer-supporting intervention is designed to make transfer-of-training an integral part of the training (Blume et al. 2010). The transfer-supporting intervention also provides guidance in a technology-enhanced environment, which substantively improves participants' study, practice effort, and performance (Bell and Kozlowski 2002).

The intervention is based on the *practice and feedback* factor of the *intervention design* determinant of transfer-of-training. The *practice and feedback* factor aims to influence the transfer-of-training output through the opportunity for participants to utilize what was learned during the training intervention (Holladay and Quinones 2003; Lee and Kahnweiler 2000; Salas et al. 1999; Warr and Allan 1998). The intervention is also closely linked to the participants' work, as this enables and facilitates the application and generalization of new competences acquired in corporate training. Participants perceive higher transfer-of-training if the intervention matches departmental goals (Lim and Johnson 2002), and realistic practice scenarios help to maintain the participants' attention and positively influence the transfer-of-training (Burke and Hutchins 2007).

The intervention guides participants seamlessly from the initial learning of training content to the application of the training content on the job. All other stakeholders who are indispensable

for positive transfer-of-training are also guided by the intervention to support the participant on the journey to the application of learnings in the work context. According to the transfer-of-training model proposed by Baldwin and Ford (1988), the participant must *learn and retain* in order to generalize and maintain learnings. Similar to the successful blended learning approach, the transfer intervention ensures an adequate sequence of learning and the application of what is learned in the work context.

Thus, the transfer-supporting intervention ensures an adequate sequence of *learning and retention* as well as *generalization and maintenance*. To foster the link (c.f. link 6, figure 2) between these activities, the transfer intervention requires participants to prepare the application of what was learned to the work context during face-to-face courses. As organizations seek to improve organizational performance through corporate training services, participants are required to note training insights that are promising for improving the individual work context in either the short or the long term. *Supervisor support* is also an important factor in the *work environment* determinant of transfer-of-training (e.g., Brinkerhoff and Montesino 1995; Broad and Newstrom 1992; Burke and Baldwin 1999; Clarke 2002; Lim and Johnson 2002; McSherry and Taylor 1994). Thus, the transfer-supporting intervention guides trainers and supervisors to provide feedback through notes, clarifying gaps of understanding the participant has in terms of training content and the application in work context.

Between face-to-face courses, the designed intervention guides the participants in developing an improvement project that documents the application of learnings in the individual work context and improvements in organizational performance. From face-to-face course to face-to-face course, the maturity of the artifact increases, and the context moves from the training to the work. Supervisors and peers are required by the transfer intervention to support this process. Besides *supervisor support*, *peer support* is also an important factor in the transfer-of-training determinant of *work environment* (e.g., Chiaburu and Marinova 2005; Facteau et al. 1995).

Stage 1 of the improvement project (Idea)

Participants initiate transfer ideas based on the transfer preparation notes. These ideas describe the improvement and the corresponding training insights to be applied in the work

context. Supervisors and trainers provide feedback on these ideas to improve and adjust the strategic alignment (departmental goals) of the learnings in the individual work context. Following the feedback, the participant has the opportunity to revise the idea according to the feedback provided. Finally, a supervisor authorizes one idea of the participant and thus provides the participants with the *opportunity to perform* (e.g., Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006). Finally, a further face-to-face course might take place.

Stage 2 of the improvement project (Concept)

Based on the transfer idea and the transfer preparation, participants develop a concept that describes the application of learnings, illustrates the case, implicates goals, references the training content, and discusses corresponding performance improvements in their work context in depth. In addition to supervisors and trainers, mentors provide feedback for the concept to influence it with their experience and knowledge (application of learnings) and to motivate the supervisor/mentor to provide participants the *opportunity to perform* in the work context. Following the revision of the concept by the participant, peers provide feedback on one or more concept(s). These concepts should be as similar as possible in terms of the application of learnings, to share ideas about different ways of applying learnings in the work context and to foster peer groups (support following training). The final revision of the concept by the participant culminates in an authorization and final feedback by the supervisor. In particular, this is done to finally adjust the improvement in the work context and to gain an overview of related shareholders who must be motivated to ensure the *opportunity to perform*. Following the finalization of the concept, a further face-to-face course might take place.

Stage 3 of the improvement project (Documentation)

The participant documents the improvement and the corresponding application of learnings on basis of the concept and the transfer preparation. In addition, the participant documents the organization (actors, tasks, milestones) of the improvement realization. Trainers, supervisors, and mentors provide feedback on the documentation to clarify the remaining inconsistencies. To ensure the opportunity to realize the improvements, participants present their potential improvements to stakeholders as well as to shareholders. In line with the presentation, a further face-to-face course might be conducted.

Stage 4 of the improvement Project (Realization)

The intervention then guides the participant to realize the improvement on the basis of the final improvement project (documentation). To follow up the training and the improvements, the participant is required to report the status of the realization in adequate time intervals. Supervisors are required to provide feedback on the reports to ensure the maintenance of the improvement and to adjust the realization to the documentation. Following the realization, participants finally report the degree of improvement in the work context and the learnings that is important for the improvement to all stakeholders and shareholders. This should influence the circumstances at work (*transfer climate*), where future participants must utilize the things learned (Burke and Baldwin 1999; Richman-Hirsch 2001).

Finally, a training evaluation is conducted that measures the transfer-of-training and the improvements based on the data generated during the transfer-supporting intervention. Research reveals that training evaluation positively influences transfer-of-training, as participants know that they will be accountable for their training performance and as training can be improved through the evaluation. Thus, the last activity in the transfer intervention is the training evaluation (e.g., four-level evaluation framework proposed by Kirkpatrick (1998)).

5.2.3 Transfer-Supporting IT Components in Learning Management Systems

This thesis contributes to the branch of technology-enhanced learning of the training research domain, as the thesis demonstrates that state-of-the-art LMS provide little support for transfer-of-training (Amrou et al. 2013). In addition, the extent to which LMS and project management systems support transfer-of-training is identified. To do so, software products of learning management systems and project management systems are identified that might be utilized to fulfill the evaluation criteria. For the evaluation criteria, the capabilities of transfer-supporting IT components are utilized that are based on transfer-of-training theory-driven design and industry requirements. The thesis also illustrates how LMS must be extended to include the capability to support transfer-of-training (Amrou and Böhmann 2015).

Moodle is identified as a leading LMS software product that provides most of the functions for users and customers. Identified as the leading web-based project management system software product, Bootcamp also provides most functions for users and customers.

Surprisingly, the project management system supports more transfer-supporting IT components capabilities than LMS do. However, LMS provide must-have capabilities for learning, such as the delivery of course material and administration.

According to Baldwin and Ford (1988), participants must learn training insights in order to transfer what was learned to the workplace. LMS aim to handle all aspects of the learning process (Gilhooly 2001). Hence, the utilization of LMS as a foundation to develop transfer-supporting IT components is preferable. However, the findings of this thesis reveal that with a LMS, too many workarounds are required, and the capabilities do not yet support transfer-of-training.

To integrate the capabilities of transfer-supporting IT components, LMS should provide functions to add adequate overviews of data. They must also structure content items as deeply as a project-based approach (work context) requires and must reference training content to activities of the project (work context). This capability enables the visualization of job-related improvements through the application of learnings and thus influences the *opportunity to perform* factor of the *work environment* determinant of transfer-of-training. To influence the *peer and supervisor support* factor, the roles of owners and others must be referenceable to these content items, users should be able to subscribe to notifications for every content item, and it should be possible to create workflows in which these content items can be used (e.g., review). Finally, the integration of the capability of adding object types like integers and of measuring these integers' values in order to measure the improvement and applied training insights in the work context enables the influence of the *transfer climate* factor.

These adjustments and extensions of a LMS would lead to the opportunity to create a work environment within a LMS that is closely linked to the learning environment, just as transfer-of-training reveals (Baldwin and Ford 1988).

5.3 Contribution to Design Science Research and Service Science

According to Peffers et al. (2007), further research should focus on problem domains where extensions are required or where the DSRM does not work well. In line with this call, this thesis, based on a multiyear research project, reports on experiences gained from it. This project focused on the design of an IS artifact that is used in a complex service system and that leads to behavioral change in an actual business organization. Based on these

experiences, this thesis contributes to the body of knowledge by providing an example for cumulative research (*"exaptation of theories and artifacts to new fields;"* Gregor and Hevner 2013, p. 347) and an extensive naturalistic evaluation that examines the actual impact of such an artifact in business environments.

Within the IS domain, in most cases, the addressed problem has its origin in other research domains. The problem of this thesis has its origin in the training research domain. Thus, the identified business problem initially has no direct associations to IS. However, instead of designing a completely new artifact, a researcher should first search for relevant artifacts that are already utilized in the problem field and that have the potential to be extended to solve the identified problem. However, the search and extension of relevant artifacts also decreases the expenditure of *design and development* time, particularly when developing instantiations. Therefore, the *Problem Identification & Motivation* activity of the DSRM was slightly extended by *"Search for relevant artifacts"* (cf. figure 7).

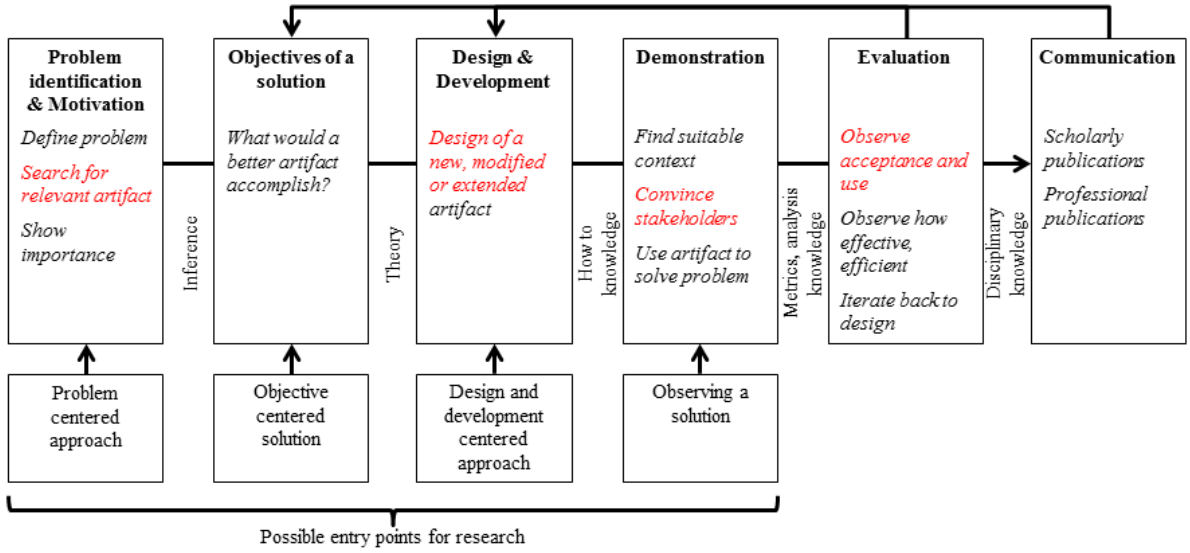

Figure 7: DSRM extension based on experiences of this thesis

The main adaptation was necessary in the design, demonstration, and evaluation activities. Because of the complex nature of service systems, the *Design & Development* activity was extended by *"Design of a new, modified or extended artifact,"* the *Demonstration* by *"Convince stakeholders,"* and the *Evaluation* by *"Observe acceptance and use."*

Particularly in complex service systems with a variety of stakeholders with partly divergent interests, the design of a valuable artifact that improves service productivity is associated with

considerable effort. The final artifact is an instantiation that modifies and extends LMS (relevant artifact) to address objectives of the desired solution. In order to achieve the goals, a transfer-supporting intervention is also adapted (*practice and feedback*), which accompanies the artifact. The LMS is part of an actual training service and thus is in direct relation to the end-customer of the service with respect to the value co-creation of the training. Hence, the implementation of the artifact must be carefully planned, the different actors convinced, and the use as well as acceptance observed. This is of importance to convince all the stakeholders of the service system and by this means to gain confidence for the implementation and evaluation in a naturalistic setting. Moreover, the customer-perceived quality can only be affected if all actors are convinced of the value of the artifact as well as of its use and if they accept the artifact. Because of the high barriers of the service system, an instantaneous implementation of the artifact in a naturalistic setting is not possible. Rather, an iterative approach is necessary in which the designer and stakeholders of the service system come closer step by step.

Within this steady consultation, primarily practical objectives must be considered that improve the use and acceptance of the artifact. This can be facilitated by the modification and extension of an already known artifact that reduces the doubt of the actors. Only after completion of this activity can the artifact be introduced into a naturalistic demonstration and evaluation, where the use of the artifact can be demonstrated and the research question answered. In order to convince all actors to introduce the artifact into a naturalistic setting and evaluate it, this thesis had to conduct five iterations through the design, demonstration, and evaluation stages.

The researchers had to deal with multiple actors from different independent companies as well as with their value co-creation. Within this complex service system, (1) the first group of actors comprised the provider of the corporate training service. The provider coordinator was a risk-averse middleman who organized the training and ensured the quality of the corporate training service. In the person's function as a coordinator, the provider coordinator needed to select appropriate trainers for the execution of the training. The trainer's job was to define the training program based on the determined topics, to develop training content, and finally, to instruct and mentor participants. The next group (2) was the company as the customer of the corporate training service. The customer coordinator represented the customer and needed to ensure, in cooperation with the provider coordinator, the quality and return on training of the

training service. The customer coordinator was also a risk-averse actor. As the end users of the training service, the participants needed to attend the training. Finally, (3) the researcher was involved and tried to get the permission to introduce the artifact into the training service.

As mentioned earlier, the researcher had to deal with risk averse-actors who wanted to reduce the variation in possible outcomes. These actors were willing to sacrifice expected returns and had a tendency to overestimate possible losses (Cross 2001; Myers 2013). Beforehand, they needed to know the outcome of the innovation, such as a decrease of efforts during the service, a facilitated value co-creation, or an improved service output. However, these things are initially quite difficult to know with only a scientific theory at hand. Even if these actors understood the approach or theory and believed what the theory was promising with respect to improving their services, there was no guarantee in the first iterations that the derived artifact would improve anything. The way to a naturalistic evaluation in complex service systems can be very time-consuming under such circumstances.

However, figure 8 illustrates the DSRM extensions, *"Design of a new, modified or extended artifact,"* "*Convince stakeholders,"* and *"Observe acceptance and use."* Stakeholders of the naturalistic setting must be convinced, and the acceptance and use of all actors must be observed and recognized in the next design iterations to obtain the permission to conduct a realistic evaluation with all stakeholders and actors. This is reflected by the *"Line of evaluation interaction"* (cf. figure 8).

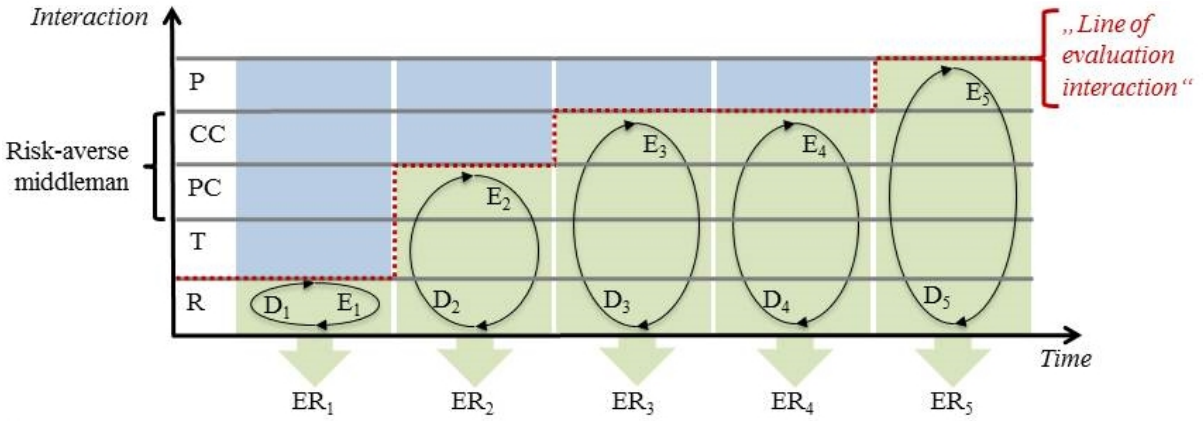

Figure 8: Line of evaluation interaction of this thesis

In the following, experiences from all five iterations as shown in figure 8 are discussed. In the first iteration, a conceptual model was derived from theory-based objectives of the desired solution. At this stage, it was not the intention to integrate end users into the evaluation of the artifact, due to its being in an early abstract stage. Therefore, the conceptual model was demonstrated for and evaluated with training research experts as a proof-of-concept at a scientific conference (Amrou et al. 2013). The evaluation was a comparison of common LMS capabilities to the conceptual model.

Within the second iteration, an improved and less abstract conceptual model was designed on the basis of the evaluation results of the first iteration (ER1). Once the researcher had found an appropriate provider of training services, the researcher tried to interact with the end users to design the artifact and evaluate the progress. In the beginning, the conceptual model was demonstrated to the provider coordinator and trainers to evaluate the artifact. At first, the artifact did not convince the provider coordinator; however, a consultation with the trainers convinced this person (cf. figure 8). Apparently, the provider coordinator instructed the trainers to ensure that the artifact was potentially able to improve the customer-perceived quality. This iteration yielded practical objectives for the solution that ensured the possible use and acceptance of the customer coordinator. However, at this stage, the provider coordinator denied the researcher to contact the customer coordinator with respect to the evaluation, because, firstly, the quality of the artifact had to be ensured.

During the third iteration, the artifact was improved on the basis of the evaluation results of the second iteration (ER2). All user interfaces and core functions were also implemented. After a demonstration of the artifact's use, the provider coordinator was convinced that it could improve the customer-perceived quality. Thus, the provider coordinator allowed the demonstration of the artifact to the customer coordinator. The customer coordinator ensures that the actors of the customer have the least possible effort throughout the corporate training and also evaluates the training to improve it and decide upon further cooperation with the provider. Unfortunately, the attempt to integrate the instantiation into a naturalistic evaluation with participants at this stage was denied by the customer coordinator. As mentioned earlier, the customer coordinator was the person in charge and needed to ensure the participants' acceptance. The participant is the most important actor and must apply as well as generalize the new knowledge on the job. This indicates that it is very important to integrate the value

co-creation perspective of the service customer into the design of the artifact as early as possible.

In the fourth iteration, the instantiation was improved on basis of the evaluation results of the third iteration (ER3). Here, a fully functional instantiation was implemented. In addition to the functions that were derived from the theory-based objectives of the previous iterations, all practical objectives were implemented. A key issue of this iteration was to ensure comprehensive use of the instantiation to ensure the artifact's effectiveness and usability as well as the acceptance of the participants. However, being able to use all functions of the instantiation, the provider and customer coordinators requested additional changes and functions before the naturalistic evaluation. Hence, the value-creation perspective of the customer had to be integrated.

During the fifth iteration, all change and function requests of the fourth iteration (ER4) were implemented into the instantiation. Finally, after a demonstration of use to the provider and customer coordinator in the fifth iteration, the researcher was able to integrate the instantiation in a naturalistic evaluation with all end users of the corporate training service. A final naturalistic evaluation was possible once all risk-averse middleman were convinced and their concerns were considered.

As shown in this thesis, the DSRM is an applicable methodology by which to structure and guide research in the IS discipline. The application of the DSRM led to slight adaptations that are illustrated in figure 7. Three premises guided the adaptions. Firstly, the thesis pursued a cumulative research approach. Secondly, because of the practice-oriented artifact design, this research evaluated results in a naturalistic way and hence, with real people, a real system, and a real setting. Finally, this thesis demonstrated the great importance of integrating the value co-creation perspective of the service customer into the design of the artifact, to allow demonstration and evaluation of the artifact within a naturalistic setting. Based on these premises, it was not just a research gap that was identified; rather, existing and relevant artifacts were identified and analyzed with respect to their abilities and limitations. This analysis added a basis for the development of an extended artifact as well as supplementary objectives.

The *design & development*, *demonstration*, and *evaluation* activities were dominated by practical experiences. Therefore, the application and evaluation of the artifacts were conducted in companies within real processes. The thesis had to deal with a multiple-actor network with partly divergent interests. Hence, the research had to convince and coordinate all actors. Additionally, because of the lengthy character of a corporate training service, the research had to accompany the training over one year to evaluate the actual impact.

However, the interpretation range of the *demonstration* and *evaluation* activities of the DSRM by Peffers et al. (2007) is broad. One could assume that the *demonstration* activity is conducted to apply the artifact and demonstrate that the artifact is able to solve the identified business problem. After a successful application of the artifact, it is applied repeatedly in the *evaluation* activity. Within the *evaluation* activity, results are observed and compared to the defined *objectives of the solution*. However, this thesis conducted the *demonstration* in order to apply the artifact and observe its application. Afterwards, the *evaluation* activity was conducted to compare the *objectives of the solution* to the actual observed results from the *demonstration* activity.

Both interpretations have their strengths and weaknesses. In the first case, the researcher ensures that the artifact is applicable in a naturalistic setting, prior to the introduction to a naturalistic evaluation. A rude awaking in the evaluation, in case the artifact is not applicable, can be excluded. However, this interpretation requires that the artifact is applied twice for each iteration. Nevertheless, this is unfeasible for the design and evaluation of an instantiation in complex service systems as in the case of this thesis. Because of the duration of the corporate training service, this interpretation would require at least two years to demonstrate and evaluate the artifact in a naturalistic setting. Therefore, the applicability in the case of the thesis was ensured through an exhaustive experimental demonstration and formative evaluation with experts as well as end users of the training service. The final demonstration and naturalistic evaluation was conducted once all experts and end users were convinced of the applicability and quality of the artifact. Through this interpretation of the *demonstration*, a lot of time was saved.

In sum, this thesis identifies theoretical foundations for the design of a problem-solving artifact in a corporate training service. Thus, a theory-based extension of an existing instantiation is emphasized. Moreover, the adoption of the solution by end users was

underlined in order to evaluate the improved transfer-of-training output through an extended instantiation in a naturalistic setting. Therefore, the DSRM is slightly adapted to stress this extension and adoption in the activities *objective of a solution*, *design & development*, *demonstration*, and *evaluation*. Considering the experiences upon which this thesis is based, it pursues a cumulative research approach and an evaluation of results in a naturalistic way. This practice-oriented approach led to slight extensions in the DSRM, which can guide future research in utilizing the process in cumulative research projects and complex service systems. This contribution can also guide the conduct of a naturalistic evaluation. Further research should consider the application of the DSRM in further research projects and should compare the challenges of different research settings. This can lead to good practice examples within the DSR paradigm.

6 Practical Contribution

6.1 Overall Practical Contribution

In addition to design knowledge contributions, effective DSR should contribute to naturalistic application environments from which the research problem or opportunity is identified (Hevner et al. 2004).

Besides their scholarly relevance, the contributions of this thesis are also highly relevant to practice. An increasing and substantial market volume demonstrates the growing need for corporate training services that improve organizational performance. However, the effectiveness of these services is limited by problems in applying, generalizing, and maintaining learnings at work. Improving transfer-of-training by leveraging transfer-of-training determinants and the possibilities of service systems thus results in a valuable practical contribution. This thesis demonstrates the efficiency of the resulting artifacts in a naturalistic setting. Thus, transfer-supporting IT components and the corresponding transfer-supporting intervention can be utilized by training providers to co-create value with the customer and to improve the transfer-of-training resulting from their training.

The utilization of transfer-supporting IT components leads to a growing knowledge repository of expertise, operations, improvements, and experts. Since users of the components can search within this knowledge repository, the components facilitate knowledge transfer. In addition to the improvement in transfer-of-training, the facilitation of knowledge transfer leads to the components' competitive advantage (Argote and Ingram 2000).

The considerable transparency and operational support of work-related improvements can lead to new services for corporate training providers. As they are the co-creators of knowledge and skills, they obtain deep customer insights. These can be used to place service innovations within the corporate service customer. The customer insights also lead to improved transfer-of-training, as the provider can adjust the training to the needs or strategy of the customer.

In addition to the improvement of transfer-of-training within a single corporate training service, transfer-supporting IT components provide more transparency of effects across multiple training instances. Thus, corporate training service providers can better evaluate the

training and the related extent of transfer-of-training. Based on the evaluation results, providers can improve their training and can demonstrate to customers the value co-created (return on training).

6.2 Facilitation of Corporate Training Service Evaluation

Training evaluation is a systematic process of collecting data to determine the effectiveness and efficiency of the training and to decide whether the training concept was successful or not (Brown and Sitzmann 2011). The most popular model used by scholars as well as in practice to describe and evaluate training is the Four-Level Model by Kirkpatrick (Kirkpatrick 1998; Van Buren and Erskine 2002). In addition to decision making, feedback, and marketing, training evaluation can be utilized to improve transfer-of-training or corporate training services (Saks and Burke 2012).

However, while many organizations evaluate the reaction and learning level, only a few evaluate on the level of behavior and results (Kraiger 2003; Twitchell et al. 2000). Research that is more recent reveals that this lack still exists; organizations are more likely to evaluate reaction (level 1) and learning (level 2) than behavior (level 3) and results (level 4). However, only behavior (level 3) and results (level 4) are related to transfer-of-training (Saks and Burke 2012). The main reason for not evaluating corporate training services on levels 3 and 4 is lack of time (Twitchell et al. 2000). Training evaluation data also consist mainly of evaluation data that are possibly subjective, such as the self-descriptions of participants (Cheng and Ho 2001).

By utilizing transfer-supporting IT components in corporate training services, the application of learnings in the work context is transparent and easily accessible through the improvement projects. Moreover, stakeholders in the improvement projects are involved and support the process of applying learnings in the work context. Thus, it is easy to obtain the data by analyzing the improvement projects in terms of the application of learning at work. In addition, the need to utilize self-descriptions that are possibly subjective and do not coincide with objective reality is made obsolete.

In terms of level 3, the concept as well as the documentation for the improvement project reveals whether or not the participant changed behavior based on what was learned. The

monitoring of KPIs and deliverables is part of the realization phase of the improvement project. This possibly indicates the effect on business value through the changed behavior of the participants (level 4). Two main problems remain, as the effect on business value might only be visible in the long term, and the measurement of KPIs might be not possible. However, by utilizing transfer-supporting IT components, the efforts required (e.g., time) to evaluate on level 3 and possibly on level 4 are reduced.

7 Limitations

In this chapter, limitations of this thesis are discussed. The chosen research approach, assumptions, research methods, and evaluation settings and the presentation of the results can limit the research.

The transfer-supporting IT components leverage the *work environment* and *intervention design* determinants. However, the *learner characteristics* determinant also positively influences the transfer-of-training output. As the naturalistic evaluation setting of this thesis was a global corporate training service, the field partners (service provider and customer) defined the factors related to *learner characteristics*, for example, the objectives of the training and the participants in the training. Hence, this thesis had no opportunity to positively influence the *learner characteristic* determinant of transfer-of-training. While the naturalistic evaluation setting did not allow for addressing *learner characteristics*, future research could extend the design knowledge on transfer-supporting IT components to allow for the individualization of transfer-of-training activities based on *learner characteristics*.

In contrast to the *learner characteristic* determinant, the influence of the *transfer climate* factor of the *intervention design* determinant can be demonstrated conceptually. The expectation is that the reporting of measurable improvements in work practice as a consequence of the corporate training leads to better circumstances for transfer-of-training within the organization.

Alternative (non-IT) interventions can also improve the transfer-of-training output of corporate training services, for example, in coaching- or error-based examples (Ivancic IV and Hesketh 2000; Smith-Jentsch et al. 1996). According to Markus (2004), information systems can be effective conduits for learning and change programs. A comparative evaluation of the performance of transfer-supporting IT-components and non-IT alternatives can reveal the relative performance of the components. Likewise, future research can seek to extend the set of components and functionalities to enable the support of other post-training interventions.

Finally, the effectiveness of the transfer-supporting IT-components and the corresponding transfer-supporting intervention were only demonstrated in a long-term corporate training service over a duration of one year.

The training was an exclusive service for the employees of one organization. However, the effectiveness of the components and intervention in other training settings of corporate training services is expected. To validate this expectation, a specific evaluation of more short-term trainings should be conducted.

Nevertheless, the continuous utilization of the components and the intervention by a national corporate training provider and a global manufacturing organization in a strategic training and development program reveals the maturity of the design achieved in five DSRM iterations.

8 Implications for further Research

8.1 Consideration of Learner Characteristics Determinant and Support of Further Intervention Designs

The learner characteristics of transfer-of-training are not considered in this thesis, but they could also positively affect the transfer-of-training output of corporate training services. Human resource systems could provide input to the transfer-supporting IT components and thus could support trainers or coordinators in their collaboration with participants. Missing presentation or other learner skills could be addressed in the training to further improve the output of training. Moreover influenced learner characteristics could be measured and passed to the human resource system.

Furthermore, this thesis only demonstrated the effectiveness of the transfer-supporting IT components in combination with the designed transfer intervention. Support of further interventions is not considered in this thesis. However, other interventions could also be integrated into the transfer-supporting IT components, for example, in the scrum or design thinking process, to transfer the learnings from a corresponding training to the workplace.

8.2 New Design Metaphor for Learning Management Systems

The majority of LMS utilize the asynchronous virtual classroom metaphor for historical reasons (Hiltz 1994; Papastergiou 2006). The focus of systems that integrate the virtual classroom metaphor is the support of teaching and learning as well as the breakdown of the physical limits of traditional classrooms (Hsu et al. 1999). The virtual classroom metaphor resulted in a transfer of physical classroom features to a virtual classroom with improved features. In fact, learning tools, materials, and opportunities for contextual discussion are provided and structured throughout virtual classrooms and course-rooms (Frank-Voutsas 2012; Yang and Liu 2007).

This thesis indicates that a substantial obstacle to the support of transfer-of-training using LMS is the utilization of the virtual classroom metaphor. The scope of action of participants is unnecessarily restricted, as the metaphor is limited to a flat structure of classrooms as well as courses.

Companies seek to improve organizational performance through corporate training services (Saks and Burke 2012). Improved organizational performance is positively related to transfer-of-training and is a key output of corporate training services (Saks and Burke-Smalley 2014). However, following the corporate training service, participants are not located in a (virtual) classroom. Rather, they are within their individual work environments. This requires having opportunities within one virtual environment to integrate their specific work environment improvement with learning content and tools. Thus, the design metaphor of LMS should not be limited to a virtual classroom or course-room. A quest for a better design metaphor for LMS is required to enable the improvement of the transfer-of-training output of corporate training services with LMS.

8.3 Organizational Performance Evaluation & Measurement

Phillips' Five-Level Model addresses the limitations of Kirkpatrick's Four-Level Modell (Phillips 1995). Level 1 (Reaction & Planned Action) measures participants' reaction to the training program and outlines specific plans for implementation (action plans). Level 2 (Learning) measures skills, knowledge, or attitude changes at the end of the training program. Level 3 (Job Application) measures changes in behavior on the job and specific applications of the training material through action plans. Level 4 (Business Results) measures the business impact of the training program. And Level 5 (Return on Investment) measures the monetary value of the results and the costs of the training program.

In large companies, all training programs are evaluated at level 1. Approximately 50% of training programs are evaluated up to level 2, while about 30% are evaluated up to level 3. Only 20% are evaluated up through organizational results (level 4), and at 10 %, only the most important training programs are evaluated up to level 5 (return on investment). The utilization of each level correlates with the ease and cost of the evaluation (Phillips and Stone 2002).

Transfer-supporting IT components could improve the ease of use and could reduce the costs of Phillips' Five-Level Model. The components could also measure changes in KPIs and indicate the return on investment for the corporate training service customer. Dashboards for supervisors and training coordinators could support an agile change of training configurations.

9 Managing for Transfer-of-Training: Directions for the Evolution of Learning Management Systems

Amrou, S., Semmann, M., and Böhmann, T. 2013. "Managing for Transfer of Training: Directions for the Evolution of Learning Management Systems," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Chicago.

Abstract

Due to the still growing relevance of lifelong learning especially in a corporate context it is necessary to ensure that efforts taken in developing competencies of employees are affecting the performance at the workplace. This transfer of training (TOT) is a well-known concept in education research. As this paper shows there is still a lack of methods that are actually utilized in practice. Especially, there is still a lack of knowledge how information technology can help to raise the TOT.

For this reason this paper is grounded on an extensive literature review and identifies how support of the TOT is utilized. After that it analyzes the use of information technology in this context and leads to implications for further research and the development of tools to enhance the TOT.

Keywords

Transfer of training, Literature Review, Learning Management System, corporate education service

9.1 Introduction

According to the ongoing gain of importance in the area of knowledge-based work, the importance of lifelong learning increases. Under this circumstance the European Union targeted a raise of the rate of workforce participating in lifelong learning from currently 9.3% to at least 15 % (Eurostat 2011). The main impulse for current participants in an ongoing learning process is to perform better in their jobs and to improve career opportunities (Eurostat 2011).

Therefore, the sector of corporate education services (CES) gains on importance due to the economic as well as the demographic changes (Eurostat 2011). In 2012 the market had a volume of $156.2 billion in the United States (ASTD 2012). With the aspired increase in lifelong learning there is still potential to increase this number. Due to this high volume of the market it is necessary for companies to ensure that the investment into CES has a pay off in the daily business. Therefore, the relevance of TOT increases in this context. This is also shown in the relevance of TOT in the scholarly publications in the field of human resources, where it is the most addressed topic (Jeung et al. 2011).

CES can be characterized by a high degree of interactivity and, consequently, individuality (Alavi et al. 2002). Actors of CES are training managers, trainers, team managers and learners (Semmann et al. 2012). CES are designed by companies and providers. The process of initiating CES is divided in pre-, on-, and post-training. During the pre-training trainer and team managers are designing the CES, in the on-training phase the knowledge is delivered through a trainer to the learners. The CES ends with the post-training phase where an evaluation through the company is conducted (Zolnowski et al. 2011). Whereas TOT until now is not conducted. TOT is defined as the dimension to which learners effectively apply the learned gained in the education service context to the job (Baldwin and Ford 1988). Estimates of the extent of the TOT problem differ, from 10% (Georgenson 1982) to 50% (Saks 2002) in behavioral and organizational change.

Traditional approaches to CES where the knowledge is usually achieved through presence lessons, has shortcomings because learners are not motivated enough to learn actively (Bates 2000). Information technology gives the opportunity to increase the motivation of the learners of corporate educational services (McCormack and Jones 1997). Because of still notable high retention and dropout rate, e-learning nowadays orientates more on communication,

collaboration and interactive face-to-face (Hoic-Bozic et al. 2009). Blended learning combines the advantages of e-learning and the approach of traditional CES, through different learning methods to promote better learning effects (Bates 2005). Learning management systems (LMS) are the state of the art systems to support any kind of CES but lack of features that address TOT explicitly (Semmann et al. 2012).

Despite this relevance of CES and the issue of learning transfer, there is a dearth of research on IT support for transfer of training. Therefore, the research question addressed in this paper is as follows: How can IT be utilized to improve the transfer of training? We seek to answer this research questions in four steps. First, we review the literature to derive determinants of transfer of training. Based on these determinants, we discuss requirements for IT-supported transfer of training. These requirements are mapped against general capabilities of learning management systems to identify gaps. We conclude with a discussion on how these gaps could be closed by future design research on transfer-supporting components for learning management systems.

The remainder of the paper is structured as follows: In the next chapter the literature review is presented and after that requirements for IT support of TOT are derived. Then these requirements are mapped with learning management systems and later on discussed. The paper ends with a conclusion and implications for further research.

9.2 Transfer-of-Training – A Literature Review

9.2.1 Methodology

To answer the research questions it is necessary to identify and analyze relevant literature. Therefore, a rigorous process has to be utilized (Webster and Watson 2002). In the context of this paper different research areas are relevant. As a result, the literature in these areas was reviewed in parallel and later on the results were merged. The disciplines are human resources, pedagogy, management research, and information systems. The search process was based on different databases that include the majority of scientific literature in these domains. For human resources and pedagogy, the German education portal and the database of the Education Resources Information Center were utilized. These sources are standards in these research areas and are widely utilized. In case of management research and information

systems research ABI/INFORM complete, EBSCO, IEEE, and Business Source complete were used.

The actual search was based on the terms “transfer of training” and “knowledge transfer” alone as well as in combination with “e-learning”. Articles with one of these terms in the title, abstract, or keywords were identified as potentially relevant. We only included peer-reviewed articles in journals or conference proceedings. The time period of results was not limited.

As a result, 51 articles in the research field human resources and pedagogy were identified and 79 articles in management research and information systems were found. In a next step a backward search approach was utilized to ensure that all potentially relevant articles were included. Based on this extensive set of articles the actual literature review was done. After a first screening of the title and abstracts 72 were identified as relevant articles. An article was marked as relevant, if it addressed TOT and determinants of it and was empirically substantiated.

9.2.2 Determinants of Transfer-of-Training

In the following, empirically supported determinants are briefly described and referenced. According to educational, adult learning, and psychological literature the identified determinants were classified into three categories. These are learner characteristics, intervention design, and work environment (Alvarez et al. 2004; Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997). Based on the extensive literature review 15 determinants that influence TOT were identified. This was done under the premise that a determinant can be judged as valid, if at least two independent empirical studies document the influence on TOT.

Learner Characteristics

In this category six determinants are subsumed. The first one is the cognitive ability of the learner and influences the transfer positively (Ghiselli 1966; Hutchins and Burke 2007). Secondly, self-efficacy as the belief of a learner in his abilities is correlated with TOT (Hutchins and Burke 2007; Saks 1995; Saks et al. 2010). The next determinant is the pre-training motivation of the learner. With a high motivation the chance to transfer knowledge to the workplace is positively influenced (Burke and Hutchins 2007; Mathieu et al. 1992; Tannenbaum et al. 1991). Anxiety or negative affectivity towards the CES negatively

influence TOT because learners are not open to the content and therefore are not able to utilize the content after the intervention (Ackerman et al. 1995; Barrick et al. 1993; Silver et al. 1995). Another facet of the aforementioned determinant is openness to experience, which can positively influence TOT if the learner is willing to engage with the intervention (Barrick and Mount 1993; Herold et al. 2006). Lastly, the perceived utility of the intervention influences the TOT if the content is related to the job requirements (Chiaburu and Lindsay 2008).

Intervention Design

This category subsumes five determinants. Firstly, learning goals have to be clear and especially the link between the content and these goals has to be addressed (Kozlowski and Bell 2006; Phillips and Gully 1997). The second determinant is content relevance, which means that the content of the intervention has to be aligned with the goals and the materials of the training to support TOT (Axtell et al. 1997; Holton et al. 2000; Hutchins 2007; Lim and Morris 2006; Yamnill and McLean 2005). The next determinant is practice and feedback as a teaching method to support a TOT through the opportunity to utilize what was learned during the intervention (Holladay and Quinones 2003; Lee and Kahnweiler 2000; Salas et al. 1999; Warr and Allan 1998). Another determinant is behavioral modeling and addresses change in the learner's behavior, which directly leads to TOT (Bandura 1997; Decker 1982). The last determinant in this category is error-based examples which are a instructional strategy and show typical mistakes according to the content and therefore can influence the TOT (Ivancic and Hesketh 2000; Smith-Jentsch et al. 1996).

Work Environment

The last category subsumes four determinants. The first determinant is the transfer climate at the workplace of the learner. This factor deals with the circumstances in which the learner has to utilize what was learned (Burke and Baldwin 1999; Kontoghiorghes 2003; Lim 2006; Mathieu et al. 1992; Tracey et al. 1995). Secondly, the supervisor's support influences the TOT according to the encouragement to utilize what was learned (Brinkerhoff 1995; Broad and Newstrom 1992; Burke and Baldwin 1999; Clarke 2002; Lim and Johnson 2002; McSherry and Taylor 1994). Analogous, peer support can also influence TOT (Chiaburu and Marinova 2005; Facteau et al. 1995). The last determinant is the opportunity to perform,

which means that the learner needs the possibility to utilize what was learned in the work environment (Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006).

9.3 Requirements for IT-Supported Transfer-of-Training

Though none of these determinants of transfer of training can be directly influenced through technology, technology can influence how these determinants become effective in corporate education services. We argue that three functional areas are particularly relevant for supporting transfer of training through IT: profiling and matchmaking of learners, preparation and planning of training transfer, as well as support and feedback for transfer activities. All of these functional areas are inherently socio-technical, i.e. IT supports human actors in performing specific transfer-related tasks.

Profiling & Matchmaking

Assured learners have adequate characteristics to pursue CES successfully and these learners are able to see the utility of CES for their jobs. A team manager or the human resources department can assure adequate characteristics that have the ability to locate CES needs of the company and of learners in their individual job-role. Thus, they must have the ability to estimate the characteristics of learners or get such information from other IT-supported environments like human resource management systems. This characteristic information should be accessible within a learner profile that includes in addition basic information and the already performed trainings. Furthermore, a job profile that shows precisely the tasks and requirements for the current job and possible next job-levels should be accessible. In addition, an education service profile that contains requirements, the content and the objectives of the CES should be given. Lastly, a user profile with capabilities to contact the owner of the profile and a history of completed CES should be established. It can be seen as a target profile. This information should be accessible and referable within a repository of the IT-supported TOT environment. Through the same repository learners should have the possibility to perform self-assessment and self-directed selection by registering for particular CES. Thus, giving the learner a sense of self-confidence and self-determination through self-selected training to increase motivation and decrease anxiety. Through a passive approval team managers can guide the learners by disapproving the CES for the learner or encouraging them to participate in a CES. In general, the actors should be able to communicate with reference to the information and profile objects. The mentioned profiles and the information

aggregated in a structured manner should support the team managers and the learners to assure the success, needs and values of CES. Nevertheless, the decisions made and the completed CES of the learners can support the team manager or the learner in choosing the right CES in the future.

Preparation & Planning

Unlike learner characteristics, technology can influence the intervention design directly by supporting the preparation and planning process of intervention elements. Technology can help in preparing the content of the CES to include design elements that support TOT (e.g. error-based examples, practice & feedback). Training managers and trainers should have the ability to create content that fits to given interventions (table 7) or future interventions that support TOT and can be referenced with above-mentioned education service profiles. Furthermore, training managers and trainers should be able to communicate and collaborate, to create content for the CES. Also, in preparation of the intervention reporting functions should be given to support the creation of content. This could be qualitative or quantitative evaluation of the interventions. If interventions have led to a successful TOT, the interventions can be translated into a template or content objects of the CES can be reused. In addition, technology can support the planning of post-training activities that ensure the application of content of the CES on the job. Hence, training managers and team managers should have the option to schedule the events and set the location of the post-training activities for each CES in corporation. Furthermore, they should be able to set milestones for the post-training activities to ensure sequential reporting of the success of the intervention.

Support & Feedback

When the learner is back at the work environment technology can influence the TOT directly, technology can help to provide support and feedback during the phase of TOT. This phase does not necessarily start after completion of the CES. It can already start during the impartation of knowledge. For instance, the trainer can provide instructor's support or support can be handled by peer-groups to the participant for the application of training content. Hence, the IT-supported TOT environment needs to offer adequate communication and collaboration methods, which are linked to the learner profile and other information objects mentioned above. The artifacts that arise from communication and collaboration should be

available for peer-learners, the (re-)design of interventions or for further learners. Thus, the resulting knowledge will not be lost and the artifacts could answer questions of learners in further CES. In addition, the artifacts can be used to improve the interventions for redesign of interventions. Also, the opportunity to provide feedback about the progress in applying training content to the job (e.g. monitoring) should be supported in this phase by the IT-supported TOT environment.

In general, the IT-supported TOT environment should support different roles of actors and have rights to view the profile and information objects that are available.

9.4 Support of IT-Supported Transfer-of-Training Requirements by Learning Management Systems

This section reviews to what extent learning management systems realize the requirements introduced above. LMS have become a default as e-learning and blended learning have been adopted widely (McCormack and Jones 1997). LMS have become an indispensable tool for CES. In the 2012 Training Industry Report, LMS were most frequently named as the technology-driven training product that CES providers either use or intent to purchase (Bradstreet 2012). Additionally, CES providers spent the highest portion of their budgets on tools and technology for their services (Bradstreet 2012). While there are many different LMS systems available on the market, Brandon-Hall developed a set of common LMS capabilities that abstract from individual LMS (Brandon-Hall 2005). In the following table, we summarize how these common capabilities provide support for the requirements of IT-supported TOT (table 7).

		LMS support for IT-supported transfer of training through …		
Common capabilities of LMS	**Description of capability**	**Profiling & Matchmaking**	**Preparation & Planning**	**Support & Feedback**
Manages e-learning	Managing (creation, structuring, cross-reference, searching, user rights) of e-learning objects and given methods.	Partially, content and object types are rudimentary.	Partially, objects can be designed with rudimentary functions and with barriers.	None

Management of classroom, instructor-led training	Scheduling events, learners and environment of instructor-led.	None	Partially, only scheduling of milestones and events.	None
Performance reporting of training results	Performance reporting through assessments and qualitative evaluation.	Partially, information types are not manageable for reporting view.	Partially, only assessments and qualitative evaluation.	Partially, only assessments and qualitative evaluation.
Learner collaboration	Collaboration and communication by common tools like forum etc.	Partially, trainer and manger could collaborate but with barriers to other objects.	Partially, trainer and manger could collaborate but with barriers to other objects.	Partially, reuse artifacts and just in time support is not supported.
Keeping learner profile data	Data of learner is kept by the LMS for further CES.	Partially, only training and rudimentary performance data.	None	Partially, reuse of artifacts is not supported.
Sharing learner data with an HR or ERP system	Import and export data of learner to resource systems.	Partially, no references to other profiles and information objects.	None	None
Competency mapping - skill gap analysis	Mapping competencies of learners to needed job skills.	Partially, no job profile available and reporting view.	None	None
Creates test questions and test administration	Creation and management (user rights, learners etc.) of offline and online assessments.	None	None	Partially, only assessments as build in feedback.

Table 7: Common capabilities of LMS mapped to requirements for IT-supported TOT

9.5 Discussion

Profiling & Matchmaking

While information objects and user profiles, e.g. learner and education service profile within the LMS are supported (creation, structuring, cross-reference, searching, user rights) by the capability *manages e-learning* (table 7), support for learner characteristics and characteristic requirements through information objects (e.g. text) are rudimentary. Furthermore, job profiles are not supported to show the learner the value of CES for their job and possible next job-levels that could motivate him. Profiles that only support text or other media as information types are not manageable to extract information for an adequate reporting view (*performance reporting of training results*). To support team managers and learners to assure the success, needs and values of CES, additional information types with defined fields are needed. Moreover, the actors are able to communicate and collaborate by the LMS capability *learner collaboration,* but with barriers to the profiles and information objects. Thus, a direct access to the profiles and information objects without losing the focus on the communication and collaboration within the *profiling & matchmaking* is only hardly possible. The LMS capability *keeping learner profile data* can support the team manager or learner in selecting future CES by completed trainings of the learners but not through decisions made by training managers or learners. In addition, linked performance data is only qualitative from subjective sources or assessment results. Data from increased performance on the job is not available. While team managers or the human resources department can import the learner profile through the LMS capability *sharing learner data with an HR or ERP system*, even in this case they have to deal with above-mentioned barriers. Lastly, the LMS capability *competency mapping - skill gap analysis* does give the team manager and learner the option to perform a skill gap analysis, but important variables for a successful TOT like learner characteristics are not included.

Preparation & Planning

Like mentioned in table 7 with LMS capability *manages e-learning* intervention design elements can be designed with rudimentary functions and with barriers. Due to limited opportunities for information types (e.g. text and media) an adequate design of objects for interventions is hardly possible. For example, the sequence of interventions can only be designed through rudimentary information types that are structured in a list view and schedule

functions by the LMS capability *management of classroom, instructor-led training*. A more advanced approach is needed to design interventions (e.g. error-based examples, practice & feedback), nearly similar to workflow editors. Some could mention why not use those and import them to the LMS, but the barriers that will arise to reference the information (e.g. milestones) and profile objects would influence the preparation process. In addition, barriers to communication and collaboration (*learner collaboration*) would arise while training and team managers (re-)design interventions. While these functions are partly supported, further functions of *preparation & planning* are unsupported. Neither qualitative nor quantitative reporting functions are given within the phase of preparation to support the creation of content of the intervention. Assessment and qualitative evaluation data is available through the LMS capability *performance reporting of training results*. In contrast, quantitative evaluation data is required in order to report the TOT. The quantitative data is measured while the learner uses the knowledge back on the job. Also, intervention cannot be translated into a template or content objects of the CES to reuse interventions that led to a successful TOT.

Support & Feedback

By the LMS capability *performance reporting of training results* in combination with *creates test questions and test administration* the opportunity to provide feedback about and within the progress in applying training content and knowledge to the job is partially supported, only assessments and qualitative evaluation is supported. Like mentioned before, quantitative evaluation data is needed. Support by instructor and peer-group support is available by the LMS capability *learner collaboration* with limitation to linked information objects and just in time support. While the LMS capability *keeping learner profile data* enables to reactivate learner data, an option to reuse communication and collaboration artifacts for (re-)design interventions or for further learners is unsupported. Capabilities in LMS to s*upport & feedback* are only rudimentary implemented for the phase of TOT, due to the core functionalities to support learning and not the TOT.

9.6 Conclusion and Outlook

In the course of the paper we identified determinants of TOT. It is striking that the majority of literature on these determinants is older than a decade and does not address the potential influence of IT on these determinants. Therefore, we recommend focusing on these issues as

we have done in this paper. Based on these determinants, we derived requirements for IT support for enhancing TOT. These requirements have been mapped to core capabilities of LMS'. This mapping revealed gaps of LMS for the support of transfer of training. In the category profiling & matchmaking interfaces to HR software should be established to enable learners as well as supervisors to easily identify education services that match a specific job profile and thus support personnel development. This also would lead to a fact-based basis for performance measurements of TOT and can help to evaluate the value of trainings. In case of the preparation & planning, a high impact on TOT could be realized through a dynamic editor to plan trainings based on different modules. At this point measurements of the aforementioned profiling & matchmaking can be used to identify modules that have a strong effect on transfer of training and to reengineer those with low impact. Lastly, in the category support & feedback functionalities have to be improved to intensify collaboration between peers as well as supervisors. At the moment this communication is only centered on the actual training and does not support later phases, where TOT takes place. Therefore, future research should address these gaps to ensure high impact of corporate education services.

9.7 Acknowledgement

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10 Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design

Amrou, S., Semmann, M., and Böhmann, T. 2015. "Enhancing Transfer-of-Training for Corporate Training Services: Conceptualizing Transfer-Supporting IT Components with Theory-Driven Design," in *Proceedings of International Conference on Wirtschaftsinformatik*. Osnabrück.

Abstract

Corporate training services have grown into a key approach for improving performance and a substantial industry in recent years due to increased job requirements, workforce flexibility and lifelong learning. Transfer-of-training is a key output of these services, defined as the application and generalization of new competences at work acquired in training. Corporate trainings are exemplars of highly co-created services. Improving the output productivity through better transfer-of-training requires collaboration between providers and customers.

IT could be an enabler to embed transfer-related activities for transferring training contents to the work. However, IT support is missing for improving transfer-of-training in corporate trainings.

Inspired by service logic and based on training research, this paper employs a theory-driven and iterative design approach to develop transfer-supporting IT components for corporate trainings. Furthermore, we present the implemented prototype, findings from several design interactions and report on the on-going summative evaluation in an international service management training.

Keywords

Transfer of Training, Corporate Training Service, Theory-Driven Design, Blended Learning, Value Co-Creation

10.1 Introduction

The growing prevalence of knowledge-based work leads to increasing participation in lifelong learning (Eurostat 2011). Changing job profiles and competencies are key drivers of this development. Corporate training services address this need through customized training programs (Alavi et al. 2002; Zolnowski et al. 2013), creating significant growth for these services (Eurostat 2011; Fritsch 2013). In scarce markets for talents, firms need to invest into the training of their workforce. In Germany alone, companies spent 28.6 bn euros for corporate trainings in 2010 (Seyda and Werner 2011). Given this substantial investment, companies seek to ensure that the investment into corporate trainings leads to an improved business performance (Saks and Burke 2012). This makes transfer-of-training to the work a key output of corporate training services. Transfer-of-training is generally accepted as "…the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job…" (Baldwin and Ford 1988). However, corporate training services seem to suffer from low productivity, as studies show that only between 10% and 50% of the corporate training contents are applied at work (Fitzpatrick 2001; Georgenson 1982; Saks 2002; Saks and Belcourt 2006).

Service logic posits that value is created by customers (Grönroos 2008) or phenomenological co-created (Vargo and Lusch 2006). If transfer-of-training is considered as the key output of corporate training services, neither customers nor providers of such services can be satisfied by the current extent of transfer-of-training output.

Scholars emphasize that neither providers nor customers can achieve improvements of service productivity individually (Grönroos and Ojasalo 2004). Improvement in the transfer-of-training output of corporate training services thus requires addressing the transfer-related collaboration between all involved actors of value co-creation. This need for collaboration is also emphasized by research on transfer-of-training (Grossman and Salas 2011). Apart from factors related to the design of the training as such, researchers have identified the characteristics of individual learners as well as the work environment as determinants of successful transfer-of-training (Saks and Burke 2012).

This research thus seeks to facilitate improvements in the output productivity of corporate training services by strengthening the transfer output of these services. We seek to do this with the design of transfer-supporting IT components. Despite the growing prevalence of

blended learning in corporate training, IT support of transfer-of-training has not yet been sufficiently addressed in research (Bates 2005; Hoic-Bozic et al. 2009). Similarly, state-of-the-art learning management systems provide only little support for transfer-of-training (Amrou et al. 2013). Thus, the research question addressed in this paper is as follows: *How do transfer-supporting IT components have to be designed to improve the transfer output of corporate training services?*

The remainder of the paper is structured as follows: The next section introduces the conceptual foundations. Then we discuss design science research and theory-driven design as the methodologies used for this research. Afterwards the theory-informed design of transfer supporting IT components and of a prototype implementation of those components will be explicated. In the following chapter we discuss results of the formative evaluation and the ongoing summative evaluation of the prototype. The paper ends with a conclusion and an outlook on further research.

10.2 Conceptual Foundations

10.2.1 Service logic, service productivity, and corporate training services

Service logic posits that value is created by customers rather than providers, while providers facilitate this process of value creation (Grönroos 2008). Therefore, service is characterized by collaboration between customers and providers as well as by contextualization of value creation to the specific setting of a customer (Böhmann et al. 2014).

Researchers have thus long concluded that traditional thinking about productivity has limited value when applied to service (Grönroos and Ojasalo 2004). A service provider cannot manage service productivity unrelated to customers as customers provide critical inputs, collaborate with providers in creating value, and accrue benefits from the service (Grönroos and Ojasalo 2004). Improvements in service productivity thus need to address the involvement of customers in the process of co-creation of value as well as the ability of customers to appropriate the value of the service in the customers' own contexts (Bitzer and Söllner 2013).

Corporate training services are specific instances of highly co-created services. Training is often provided as an internal or outsourced service (Frankhauser 2005). Training is an

organized, systematic series of activities designed to enhance an individual's work related knowledge, skills and understanding or motivation (Skinner 1968), which is provided to improve performance on the job (Goetsch and Davis 2010). Achieving this output requires collaboration between customers and training providers as well as contextualization to meet the specific training needs of individuals and organizations (Bitzer and Söllner 2013). Customers need to share need-related knowledge for the design and/or customization of corporate training services, to enable participation in the training and/or participate, as well as to provide a conducive environment for applying new skills and knowledge acquired through training on the job.

The service logic lens led us to conceptualize the critical outputs of corporate training services based on training literature (Kirkpatrick 1998). Therefore, we focus on the collaboration and contextualization of corporate training services in order to improve the ability of customers to appropriate the value of training in the form of performance improvements. This appropriation requires learners to generalize learnings and to apply them to the learners work. The output of this process is called transfer-of-training (Baldwin and Ford 1988).

10.2.2 Transfer-of-Training

According to interdisciplinary research, three determinants affecting the transfer-of-training output are identified. These are learner characteristics (Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997), intervention design (Burke and Hutchins 2007; Holladay and Quinones 2003; Lee and Kahnweiler 2000; Salas et al. 1999a; Warr and Allan 1998), and work environment (Alvarez et al. 2004; Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997).

Learner characteristics subsume individual characteristics of the learner like motivation, cognitive ability, and self-efficacy (Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997). An influence on these factors is only partially possible during the training and therefore, the effectiveness of transfer-supporting IT components is limited.

Intervention design summarizes factors of the design and delivery of the corporate training service. Relevant factors are a clear definition of training goals, the relevance of training content, behavioral modeling and the utilization of error-based examples (Burke and Hutchins 2007; Holladay and Quinones 2003; Lee and Kahnweiler 2000; Salas et al. 1999b; Warr and

Allan 1998). These factors can be addressed and are addressed by learning management systems and therefore, are not focused in this paper (McCormack and Jones 1997).

Work environment subsumes factors that are related with the job of the learners of the training program (Ford and Weissbein 1997). Relevant factors are transfer climate, peer and supervisor support, and opportunity to perform (Burke and Baldwin 1999; Kontoghiorghes 2001; Lim and Morris 2006; Mathieu et al. 1992; Tracey et al. 1995). Transfer climate describes the circumstances at the workplace, where the learner has to utilize the content of the corporate training service (Burke and Baldwin 1999; Kontoghiorghes 2001; Lim and Morris 2006; Mathieu et al. 1992; Tracey et al. 1995). This includes the intra-organizational willingness for accepting changed post-training behavior. A positive transfer climate significantly enhances transfer-of-training and the effectiveness of post-training interventions (Burke and Baldwin 1999; Richman-Hirsch 2001). Supervisor support describes the involvement of supervisors in the process of adapting new knowledge on the job. For example, supervisors can tolerate longer times per task of a learner during the first application or encourage a learner to utilize the training content. Empirical studies show that participation of supervisors in the training service positively affects transfer-of-training output (Brinkerhoff and Montesino 1995; Burke and Baldwin 1999; Clarke 2002; Sookhai and Budworth 2010). Peer support subsumes support of colleagues and support of other learners of the corporate training service (Chiaburu and Marinova 2005; Facteau et al. 1995; Hawley and Barnard 2005). Peers can discuss among each other different ways of applying training contents on the job. Opportunity to perform describes the possibility to utilize the learnings in daily business (Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006). To enable this opportunity it could be necessary to reduce workload after the training to enable the application of learnings.

Out of these three determinants work environment is barely addressed in recent literature and lacks of concepts to improve transfer-of-training with IT-support, although research has clearly demonstrated the critical role of it (Amrou et al. 2013; Burke and Hutchins 2007). Moreover, the corporate training service can be easily embedded in the work setting by IT. On this account we focus on the work environment determinant as a novel approach to improve transfer-of-training output in a target-oriented way.

10.3 Research Design and Methodology

The research described in this paper generally follows the design science paradigm. Hevner et al. (2004) require researchers to build on prior research for advancing design knowledge. To fulfil this requirement, we adopt theory-driven design that has been proposed by Briggs (2006). Briggs advises design researchers to determine an output variable they seek to change and to search for a guiding theory that helps to understand causal relationships related to the chosen output variable. The design should build on these causal relationships by designing artifacts that influence the theoretically identified determinants of the chosen output variable. We follow this reasoning in this paper by choosing transfer-of-training as our intended output variable and search for theoretical guidance how transfer-of-training is determined. As explained earlier, the work environment yields key determinants of transfer-of-training. Figure 9 illustrates that we design (1) transfer-supporting IT components to improve the (2) determinants of transfer-of-training related to the work environment.

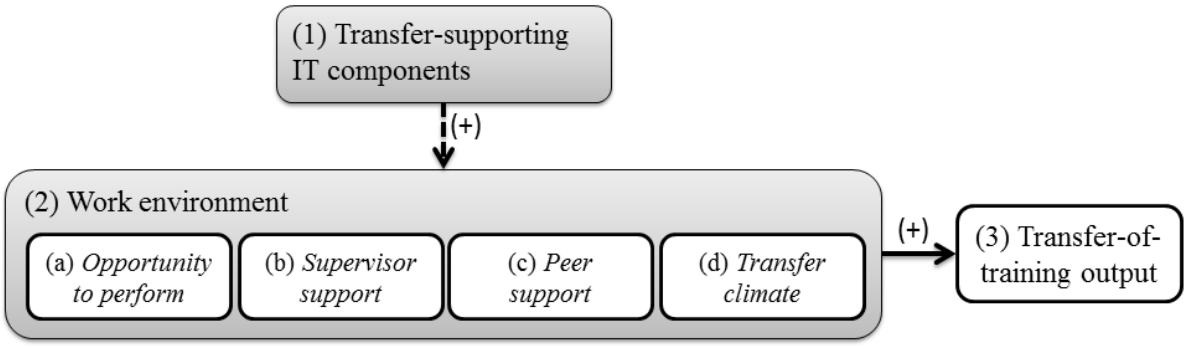

Figure 9: Theory-driven design approach for transfer-supporting IT components

To evaluate the transfer-supporting IT components, a fully functional prototype has been developed and embedded into transfer-focused management training programs.

Guided by the underlying theory on transfer-of-training, the research process follows an iterative search for the detailed design of the transfer-supporting IT components. In particular, we adapted Arnold et al.'s "Community Platform Engineering Process" (CoPEP) for our design efforts (Arnold et al. 2003). This approach institutionalizes discussions with the target audience, thus improving the applicability and utility of the components for participants, managers and trainers in corporate training services. According to CoPEP four iterations with four phases are appropriate. As illustrated in figure 10 each iteration results in a more accurate

artifact (iteration 1-3) or in an instantiation (iteration 4). A single iteration consists of phases for planning, analysis, development, and evaluation.

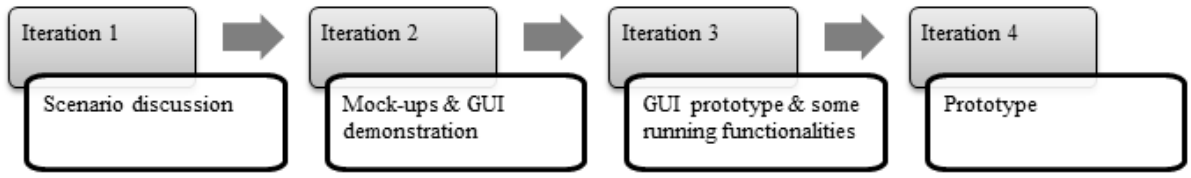

Figure 10: Adapted iterations of Arnold et al.'s "Community Platform Engineering Process" (Arnold et al. 2003)

We started with the planning phase and scheduled the activities for the corresponding iterations. Subsequently we analyzed prior field studies in addition to corporate training service phases of the field partner and searched for a suitable theory in iteration 1. As mentioned above we adapted the theory of the transfer-of-training output and utilized it in a theory-driven design approach. After the development phase of iteration 1 we evaluated the requirements of the transfer-supporting IT components with experts. Based on the extended requirements and the analysis of these with experts in iteration 2 we developed a demonstration prototype. Afterwards an evaluation of the demonstration prototype with experts was conducted. The translation of the socio-technical requirements into the system design was done iteration by iteration with the assistance of experts as well as end users in iteration 3 and is currently conducted with end users in iteration 4. Finally the instantiation of the transfer-supporting IT components will be introduced to the broader public after the end of iteration 4 and a summative evaluation with end users and experts.

10.4 Derivation of Transfer-Supporting IT Components

10.4.1 Context of use of transfer-supporting IT components

In this section, we derive transfer-supporting IT components that are based on the factors of transfer-of-training related to the work environment determinant.

For the application and generalization of new competences acquired in a corporate training service, it is necessary that a training program is closely linked to the learners' work. One effective post-training intervention for linking training and work is the use of field projects that guide learners to apply new competences acquired in a training context to achieve

improvements in their work (Bell 2010; Danford 2006; Fernandez and Williamson 2003; Lim 2000; Nikandrou et al. 2009; Olivero et al. 1997; Seethamraju 2012). The transfer-supporting IT components leverage such a project-based approach for improving the effect of training on the job. In this project-based approach, learners are encouraged to develop an improvement project for their specific work setting that leverages the competences acquired in the training program. Already during the formal training, learners are guided in a structured process to capture relevant content, develop project proposals, and receive authorization by management stakeholders to pursue the project. The design and implementation of the project can be supported by IT to give a seamless experience as well as integrate the project into the actual training and work.

Figure 11 illustrates the context of use of the derived transfer-supporting IT components within our project-based approach. To transfer the knowledge from the training environment to the work the trainer instructs learners during the training to capture new knowledge relevant to the work setting in a transfer journal (C1). Based on this transfer journal, learners develop initial ideas for an improvement project. Based on the project idea and initial feedback of trainers and supervisors, learners develop a project charter (C2) in which the learner describes key aspects of the project. Moreover, the project charter is used as a basis for feedback and, eventually, as an agreement with key stakeholders (learner, supervisor, mentor and trainer; C3) about the improvement project (Snyder 2013). Subsequently, learners develop a detailed project concept based on the project charter in order to be able to implement the project within their work. During the implementation learners report (C4) the ongoing status of the projects and update information about achieved improvements (changes in KPIs of the job). A post-implementation review finally assesses the application of training content as well as performance improvements. Throughout the development of the project idea until the implementation of the project, supervisors and peers are encouraged in structured process to provide feedback on the specific projects.

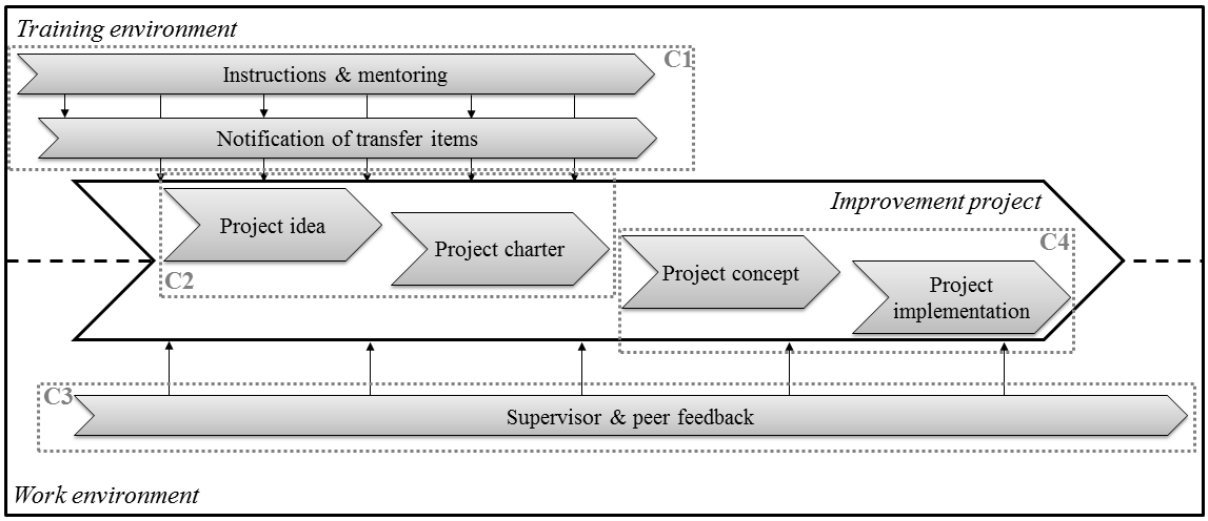

Figure 11: Context of use of derived transfer-supporting IT components

In earlier research we identified requirements for transfer-supporting components and showed that transfer-of-training has not yet been sufficiently addressed within Learning Management Systems (Amrou et al. 2013). Table 8 gives an overview of the derived functions for transfer-supporting IT components and the corresponding factors of the transfer-of-training work environment determinant.

Work environment factors	**Description of factors**	**Derived functions for IT components**
Opportunity to perform (Figure 9, 2a)	Possibility to utilize training content and learnings in daily business (Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006).	Transfer journal (C1), knowledge assets for project (C2), project review and authorization (C3), regular traffic-light-report on improvement project (C4)
Supervisor Support (Figure 9, 2b)	Supervisor involvement in process of adapting training content in work environment (Brinkerhoff and Montesino 1995; Burke and Baldwin 1999; Clarke 2002; Sookhai and Budworth 2010).	KPIs (C2), milestones (C2), project review and authorization (C3), detailed feedback function (C3), regular feedback cycles (C3)

Peer Support (Figure 9, 2c)	Support of colleagues at training and work environment and of other learners at corporate training service (Chiaburu and Marinova 2005; Facteau et al. 1995; Hawley and Barnard 2005).	KPIs (C2), milestones (C2), project review and authorization (C3), detailed feedback function (C3), regular feedback cycles (C3)
Transfer climate (Figure 9, 2d)	Circumstances at work environment, where learner has to utilize the training content (Burke and Baldwin 1999; Kontoghiorghes 2001; Lim and Morris 2006; Mathieu et al. 1992; Tracey et al. 1995).	Responsive light-weight web-based service, easy access to stakeholders, tracking of measureable improvements of improvement project (KPIs; C4)

Table 8: Mapping of work environment factors to derived IT components

The components are implemented as responsive web-based services that give ubiquitous access to all information needed and to all actors of the corporate training service. Since it is not easy for companies to give all stakeholders (e.g. trainers) access to the infrastructure (e.g. project management software and network). This concept ensures that training content and support is utilized on the job and that the value of a corporate training service is explicated. In summary, the solution described provides IT components that allow the learner to:

- Reflect important training content to capture new competencies.
- Develop and document transfer-related projects in a structured way.
- Request and receive feedback from supervisors and peers as well as provide feedback to peers.
- Communicate the status of the project to supervisors and interested colleagues.

Moreover supervisors have the opportunity to authorize the project of the learner and to influence the project by feedback. Finally, the training can be evaluated by the service provider and customer, to improve the training constantly. According to our knowledge base neither learning management systems nor project management software provides such a combination of components and functions like the transfer supporting IT components described (feedback, project definition and trainings content). Each component is derived from the transfer-of-training work environment determinant, to be able to measure the improvements that could be achieved by addressing the factors of this determinant with IT

components. An exemplary view of the web-based service with highlighting key functionalities is given in figure 12.

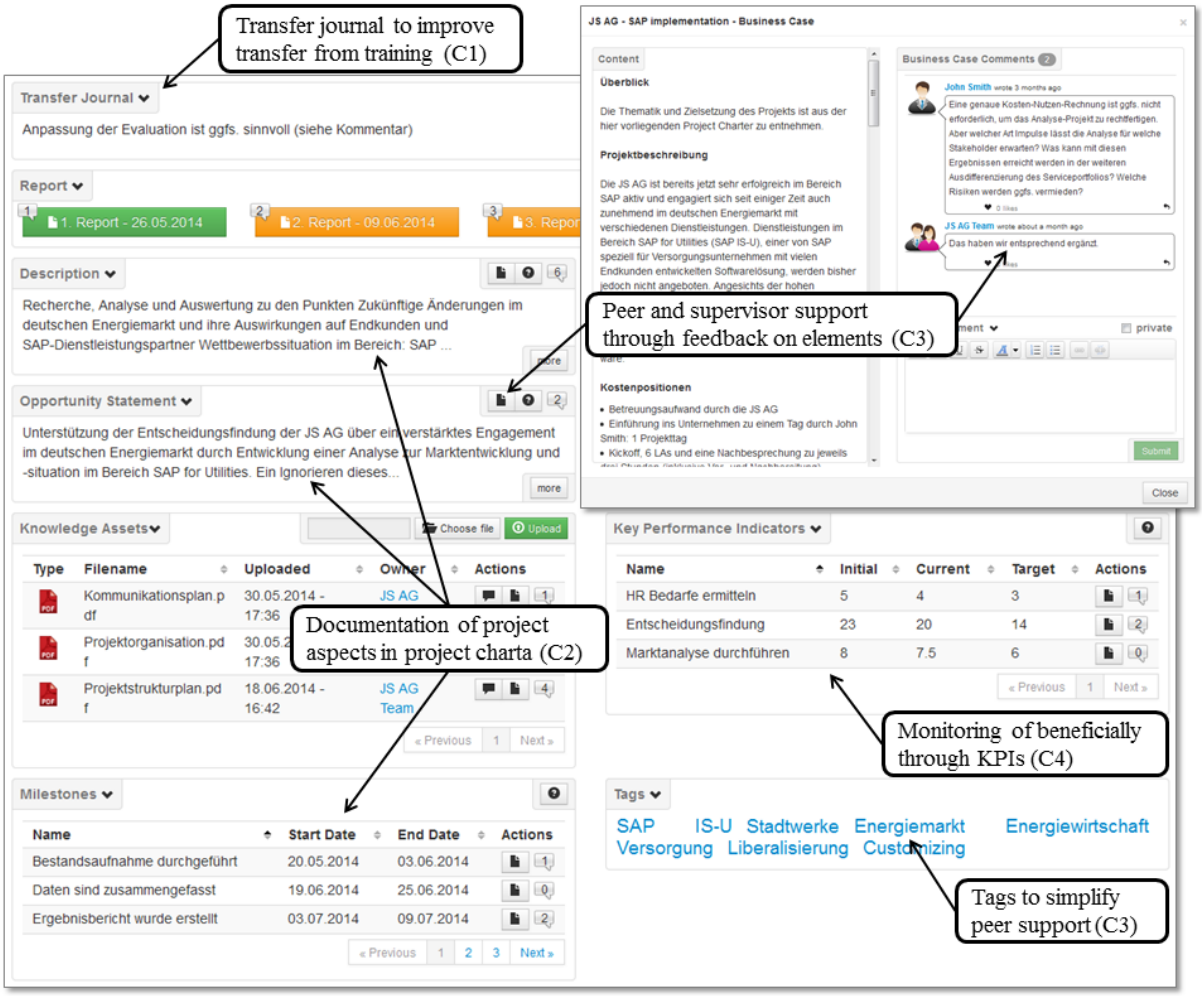

Figure 12: Exemplary view of the web-based service highlighting key functionalities

10.4.2 Competency development, project definition, coordination and feedback

The components competency development, project definition, and coordination and feedback enable learners to specify their projects in detail. The center of the project definition component is the project charter (C2), which helps to define projects in a structured way and enforces an explication of the utility. For example, a business case as well as an opportunity statement has to be defined. This project charter has to be accepted by a supervisor who commits to the project (C3). This gives the learner the mandate to implement change in current work practice (opportunity to perform). Moreover, knowledge assets that match to the content of the corporate training service have to be specified and give the opportunity to

easily access training materials (opportunity to perform). This association can help to implement the learnings in the actual work setting and support the utilization of it. This ensures a comprehensive utilization of the content on the job. Furthermore, it enables the learner to get feedback of supervisors as well as peers on the chosen approach and afterwards to comment on it and share the experience gained (C3). Nevertheless, other users (e.g. future learners) can easily retrace certain knowledge to a certain training over the tag function and learn from the experiences (e.g. comments) of prior projects. Furthermore, learners can note information out of the training within the project charter to connect their project ideas with the training content (C1, C2).

In this structured manner it is easily possible for peers as well as supervisors to give feedback in the form of comments on every item of this project charter (peer and supervisor support, C3). As a consequence critical commitment is enabled. The components encourage supervisors to evaluate project proposals and provide feedback. Moreover, the component can require the supervisor to accept or reject proposals and indicating their sponsorship for individual projects. The intention is to encourage commitment of supervisors, mentors as well as trainers to the project and thus ensure their ongoing support. Moreover, such formal agreement can also corroborate the opportunity to perform. From the peers point of view it is possible to discuss the project and identify barriers, possible problems and improvements in the project plan based on this charter. Finally, the level of involvement of peers should be transparent to enable a high visibility towards supervisors. This visibility is a strong incentive for learners to engage in peer feedback.

10.4.3 Project benefits tracking

This component subsumes functionalities to track a project and its benefits. Based on the project charter, the progress in terms of development of addressed KPIs and completion of milestones is possible (C4). This high transparency based on facts helps to explicate the value of a corporate training service. Supervisors and peers can monitor the projects with the help of this component. These groups are encouraged to give feedback on every progress report (peer and supervisor support, C3). Besides milestone reports, these components demand regular traffic-light-reports that state the current status of the project and specify possible changes in the chosen approach by the definition of necessary activities or problems with the transfer-of-training content (opportunity to perform). From a peer’s perspective these reports can help to learn from the experience of other learners by applying the training contents to their work.

Moreover, good practices can be identified and generalized to support transfer-of-training. For supervisors it bears the possibility to compare pre- and post-training performance. Such a comparison can explicate the utility of corporate training and encourage supervisors as well as human resource managers to constantly give opportunities to perform. Over time and with experience, this approach can influence positively the expectation regarding corporate training services. This influences the transfer climate in a company by providing measureable improvements in work practice as a consequence of the corporate training service. To enforce this change the perception and relevance of a corporate training service has to be clearly highlighted. This can be done by the explication of utility of the corporate training service in terms of making positive effects visible. For instance, improvements have to be captured, reported and related to the corporate training service. This should lead to a change in the corporate mindset over time. This explication is done throughout the whole concept of the intervention where clarification of utility is the main focus.

10.5 Evaluation

We utilized the "Comprehensive Framework for Evaluation in Design Science Research" by Venable et al. (2012) to ensure that the selected evaluation strategy and method for the evaluation of the transfer-supporting IT components are appropriate.

The framework by Venable et al. (2012) differentiates between evaluation strategies along two dimensions: (1) ex-ante vs. ex-post evaluation and (2) artificial vs. naturalistic evaluation. In the first dimension, ex-ante evaluation seeks to evaluate an artifact prior to implementation and use, while an ex-post evaluation does so while the artifact is in use. In the second dimension, an artificial setting denotes an evaluation outside the intended context of use of the artifact (e.g. through simulation or in a lab), while a naturalistic setting refers to a real context of use. Over the entire development process of four iterations, we chose an ex-ante, artificial evaluation approach for the first three iterations and a naturalistic, ex-post approach for the last iteration. The outputs of the first three iterations are uninstantiated artifacts (design, partial prototypes). Accordingly, these artifacts cannot be used in a naturalistic field setting, e.g. a real corporate training service. These artifacts can be evaluated in a formative way using feedback from potential users and domain experts (Pries-Heje et al. 2008). In contrast, the robust prototype as the output of the last iteration should be subjected to a naturalistic evaluation by using it in field settings like a corporate training service.

As of now, we concluded three iterations. In the first iteration, we developed service blueprints to align the theoretically derived transfer-of-training insights with the process of corporate training services (Bitner et al. 2008). The blueprints were evaluated in a workshop with four domain experts. In the second iteration, we designed mockups based on the service blueprints to ensure that the required functionalities are integrated in the early-stage concept and the design is appropriate to support learners. We evaluated these mock-ups during two independent expert workshops with four and two domain experts. In the third iteration, we developed a demonstrator based on the feedback of the prior iterations. It was used to show the workflow of the main processes of the improvement projects and represented the dashboard for training program managers. The demonstrator was evaluated with both domain experts and participants the training program. We conducted six in-depth interviews with program managers and trainers of training services who have many years of experience in customer-centered programs. In addition, we presented the demonstrator to seven participants of a national corporate training service and collected their feedback in in-depth interviews.

Based on the findings of the third iteration, we developed a fully functional prototype. A key issue in the later iterations was to ensure comprehensive use of the transfer-supporting IT components to ensure their effectiveness. As a response to this issue, we developed a number of functional improvements for engaging learners, supervisors, and training professionals in the development and implementation of improvement projects. Among those functional improvements a transfer journal was implemented which learners can use throughout the training to note insights for improving their work. Also, we improved the feedback function and added regular reports (traffic-light-reports) to keep key stakeholders and peers involved. Finally, we added a fine-grained notification system that alerts all actors of new relevant information with regard to improvement projects and reminds them about pending assignments for reviewing, giving feedback, and/or authorizing improvement projects. Most importantly, we developed a detailed guide with domain experts that illustrates how the transfer-supporting IT components should be used throughout the training and which actors need to become involved at which time to ensure the collaboration between customers and providers for creating a conducive work setting to improve transfer-of-training output.

Currently, the transfer-supporting IT components are subjected to a summative evaluation that seeks to determine the usability and effectiveness of the components. As argued above, we follow an ex-post and naturalistic evaluation approach with real users, a real problem and a

real system (Venable et al. 2012) in two field settings. First, we introduced the prototype to an international corporate training program for service managers of a manufacturing company. This training program involves multiple courses with an embedded improvement program. The program has run several times in the last 36 months for the same company. Second, we introduced the prototype to an industry-based project module of an IT management master's program that has run recurrently. The evaluation focuses on the work environment determinant of transfer-of-training as well as on the transfer outcome of the improvement projects. We use a mixed-method design involving stakeholder interviews, data from system use and project documentation. Data on system use reveals the support provided by peers and supervisors. The project documentation establishes the opportunity to perform and the explication of utility based on the project plan and the outcome. Data from project documentation is analyzed using independent researchers for coding data. Finally, the results of the interviews (qualitative data) and the document analysis (quantitative data) are triangulated to improve the robustness of the findings (Myers 2013). This gives a comprehensive view on the usability and effectiveness of the components regarding an improvement of the transfer-of-training output.

10.6 Conclusion, Outlook, and Limitations

In the course of this paper we discussed transfer-of-training as a key output of corporate training services and the need for collaboration between service providers and customers for improving the productivity of these services. Inspired by service logic and based on training research, we presented the design and prototype implementation of transfer-supporting IT components that seek to improve transfer-of-training output with a focus on factors of the work environment determinant. We also evaluated the concept in a formative manner with an iterative approach and have completed three out of four iterations. The concept and prototype of transfer-supporting IT components proposed in the paper show how IT can be used to improve transfer-of-training output. Such improved transfer-of-training contributes positively to the process of value co-creation of corporate training services. Moreover, we contribute to the field of blended learning concepts on corporate settings where transfer-of-training is scarcely addressed and there is a lack of evidence-based design knowledge on transfer-supporting IT components.

As described before, the components are highly interactive to improve the transfer-of-training output of a group of learners. A main focus is the high interaction of learning with key stakeholders to explicate the value of the training content as well as use feedback for improving the application of new competences on the job. The proposed design of the transfer-supporting IT components contributes on an academic level to the knowledge base for designing learning technologies. Besides this scholarly relevance, the transfer-supporting IT components are highly relevant to practice, too. As mentioned before, the need of efficient corporate training services is simultaneously rising with the market volume. The increased transparency of transfer effects allows service providers to demonstrate the value created for customers of these services and to improve their training services in the future. Likewise, the customer can better gauge the extent of transfer and manage corporate training accordingly.

However, there are some limitations of the concept. The derived components aim to leverage the work environment but there are other determinants that can also affect transfer-of-training output, such as the characteristics of individual learners. In further research, such determinants could be incorporated into the design. Moreover, there are post-training interventions other than improvement projects that could improve transfer-of-training output, such as coaching. Likewise, future research could seek to extend the set of components for supporting alternative post-training interventions. Finally, the transfer-supporting IT components have so far only been subjected to an ex-ante, artificial evaluation with the ex-post, naturalistic evaluation still on-going. However, the readiness of a global manufacturing company to accept the use of the components in a strategic HR development program demonstrates the maturity of the design achieved in the first three iterations.

10.7 Acknowledgement

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11 Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be

Amrou, S., and Böhmann, T. 2015. "Improving Transfer-of-Training with Learning Management Systems: Where We Are and Where We Should Be," in *Proceedings of Americas Conference on Information Systems (AMCIS)*, Puerto Rico.

Abstract

Because of increased job requirements, workforce flexibility and lifelong learning, corporate training services have grown into a key approach for improving organizational performance. Transfer-of-training is a key output of these services, defined as the application and generalization of new competences at work acquired in training.

Today corporate trainings focus on blended learning by combining learning technologies and face-to-face scenarios. Despite the growing prevalence of blended learning, the extent of transfer-of-training support by IT-based learning management system solutions has not yet been sufficiently addressed in research.

We first evaluate to which extent the leading learning management system solutions provide support for transfer-of-training. We do so by building on evaluation criteria that have been developed in a process of theory-driven design and industry requirements. Based on the findings we propose areas for future research and development opportunities where evidence based design knowledge is needed to extend the capabilities of learning management systems.

Keywords

Corporate training services, transfer-of-training, technology enhanced learning, asynchronous virtual classroom, software product evaluation

11.1 Introduction

Changing job profiles and competencies are key drivers of the growing prevalence of knowledge-based work that leads to increasing participation in lifelong learning (Eurostat 2011). A key contributor to lifelong learning are corporate education services (Salas et al. 2012; Zolnowski et al. 2013). Given the substantial investment in Germany of € 28.6 billion for corporate trainings in 2010 (Seyda and Werner 2011), companies seek to ensure improved business performance following the training (Saks and Burke 2012). Research has shown that transfer-of-training is positively related to business performance, and therefore is a key output of corporate training services (Saks and Burke-Smalley 2014).

Transfer-of-training is generally understood as the effective application, generalization, and maintenance of knowledge, skills, and behavior by participants from the training to the work (Baldwin and Ford 1988). Studies show that there is a transfer-of-training problem, because only few of what was learned in training is effectively applied at work (Baldwin and Ford 1988; Saks and Belcourt 2006).

Apart from factors related to the intervention design, researchers have identified the learner characteristics as well as the work environment as critical determinants of transfer-of-training (Amrou et al. 2013; Saks and Burke 2012). The transfer-of-training determinant work environment subsumes factors related with the environment of the participants' workplace like transfer climate, peer and supervisor support, and opportunity to perform (Alvarez et al. 2004; Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997). The work environment determinant is promising to improve the transfer-related contextualization and collaboration of all human actors by IT support in corporate training services (Amrou et al. 2015).

Today training focuses on blended learning by combining technology enhanced learning and interactive face-to-face scenarios (Gribbins et al. 2007). Regardless of the expanding prevalence of blended learning in corporate training services, technology enhanced transfer-of-training has not yet been sufficiently addressed in research (Amrou et al. 2013; Bates 2005; Hoic-Bozic et al. 2009; Semmann et al. 2012). Today, learning management systems have become indispensable for supporting corporate training services (Bradstreet 2012; McCormack and Jones 1997). These tools are sometimes also called course management system, learning content management system, managed learning environment, learning

support system or learning platform (Lonn and Teasley 2009; Martín-Blas and Serrano-Fernández 2009). One effective intervention to foster transfer-of-training is the use of field projects in which participants apply knowledge and skills acquired in the training to effect improvements in their work environment (Bell 2010; Lim 2000; Olivero et al. 1997). Field projects show how training becomes embedded in work context. From the perspective of IT support for transfer-of-training, managing training-related tasks and projects in a work context becomes a key requirement in order to leverage such a project-based approach for improving the effect of training on the job. This leads us to the following research questions:

- *To what extent do widely used learning management systems support transfer-of-training?*
- *What are future research and development areas to improve transfer-of-training with learning management systems?*

As many learning services are routinely supported by technology these days, we first study to which extent the most widely used learning management system also provides support for transfer-of-training. We do so by building on design knowledge of transfer-supporting IT components that have been developed in a process of theory-driven design and industry requirements (Amrou et al. 2015). In order to validate our findings, we also contrast learning management systems and the transfer-supporting IT components with the capabilities of a state-of-the-art project management system. Such a system is an alternative means for enhancing the conduct of training-related field projects in the work setting. Based on these analyses, we propose areas for future design-oriented research where evidence-based design knowledge is needed to extend the capabilities of learning management systems. The paper ends with a conclusion and limitation of the research.

11.2 Design Knowledge on Transfer-Supporting IT Components

According to Hevner et al. (2004) researchers should build on prior research for enhancing design knowledge. We do so by basing our transfer-related evaluation of learning management systems on design knowledge acquired in an design science project for designing transfer-supporting IT components (Amrou et al. 2015). This design research project adopted a theory-driven design approach as proposed by Briggs (2006), focusing on transfer-of-training as the output variable we intend to improve. Moreover, among the factors

influencing transfer-of-training the design focuses on factors related to the work environment of the training participants. Figure 13 illustrates the cause and effect relationships underpinning the design of the transfer-supporting IT components.

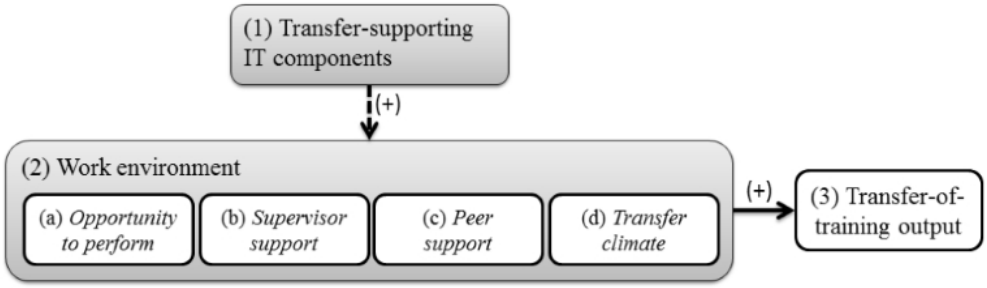

Figure 13: Cause and effect of transfer-supporting IT components (Amrou et al. 2015)

Beside this theory-driven design, expert interviews yielded industry requirements. Not surprisingly, the interviews revealed that it is necessary to closely link the training program to the participants' work, in order to foster the application and generalization of new competences acquired in a corporate training service. Project-based business is becoming increasingly important these days (Ajmal et al. 2010) and the utilization of field projects is one promising post-training intervention to link the training program with the participants' work (Marsick 1990).

Participants are guided by the field project to apply and generalize new competencies acquired in a training program to improve their work (Bell 2010; Lim 2000; Olivero et al. 1997). To improve the effect of a training program on the job, transfer-supporting IT components should support such a project-based approach. More precisely, participants have to develop an improvement project for their work setting in the project-based approach that uses the competencies acquired in the training program. Once the formal training begins, participants have to capture relevant content, develop project proposals, and receive feedback as well as authorization by management stakeholders to start the project.

Table 9 provides an overview of the functions of the transfer-supporting IT components (C1-C4) and the corresponding factors of the transfer-of-training work environment determinant.

Work environment factors	**Description of work environment factors**	**Functions of transfer-supporting IT components**
Opportunity to perform (Figure 13, 2a)	Possibility to utilize training content and learnings in daily business (Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006).	Transfer journal (C1), knowledge assets for project (C2), project documentation (C2), project review and authorization (C3), regular traffic-light-report on improvement project (C4)
Supervisor Support (Figure 13, 2b)	Supervisor involvement in process of adapting training content in work environment (Brinkerhoff and Montesino 1995; Burke and Baldwin 1999; Clarke 2002; Sookhai and Budworth 2010).	KPIs (C2), milestones (C2), project documentation (C2), project review and authorization (C3), detailed feedback function (C3), regular feedback cycles (C3)
Peer Support (Figure 13, 2c)	Support of colleagues at training and work environment and of other learners at corporate training service (Chiaburu and Marinova 2005; Facteau et al. 1995; Hawley and Barnard 2005).	KPIs (C2), milestones (C2), project documentation (C2), project review and authorization (C3), detailed feedback function (C3), regular feedback cycles (C3)
Transfer climate (Figure 13,2d)	Circumstances at work environment, where learner has to utilize the training content (Burke and Baldwin 1999; Kontoghiorghes 2001; Lim and Morris 2006; Mathieu et al. 1992; Tracey et al. 1995).	Responsive light weight web-based service, easy access to stakeholders, tracking of measureable improvements of improvement project (KPIs; C4)

Table 9: Relation between work environment factors and transfer-supporting IT components (Amrou et al. 2015)

The context of use of the transfer-supporting IT components prototype within our improvement project approach is illustrated in figure 14. In order to transfer the knowledge from the training to the work setting the trainer instructs participants during the training to capture new knowledge relevant to the specific work setting in a transfer journal (C1).

Participants develop initial improvement project ideas based on the knowledge that is captured in the transfer journal. Supervisors and trainers provide initial feedback to the project ideas and decide whether or not the project idea should be further developed. Based on

accepted project ideas and the feedback, learners develop a project charter (C2) in which key aspects of the project are documented.

The resulting project charter serves as a basis for feedback and, possibly, as an agreement between all stakeholders (participant, supervisor, mentor and trainer) of the improvement project (Snyder 2013). Throughout the improvement project supervisors and peers are encouraged to provide feedback on the specific projects (C3).

In order to be able to implement the improvement project within their work setting, participants develop a detailed project concept based on the project charter. The ongoing status of the improvement project and new insights of achieved improvements (e.g., key performance indicators) are reported to all stakeholders by the participants during the implementation. Furthermore, participants can ask for help related to the project following the training program (e.g., training content and methods). All stakeholders are encouraged to answer those questions and give feedback (C4).

The application of training content and performance improvements is finally assessed by a post-implementation review (C3). Every transfer-supporting IT component of the prototype should make it possible to insert object types like files (videos, pictures, etc.) and styled text.

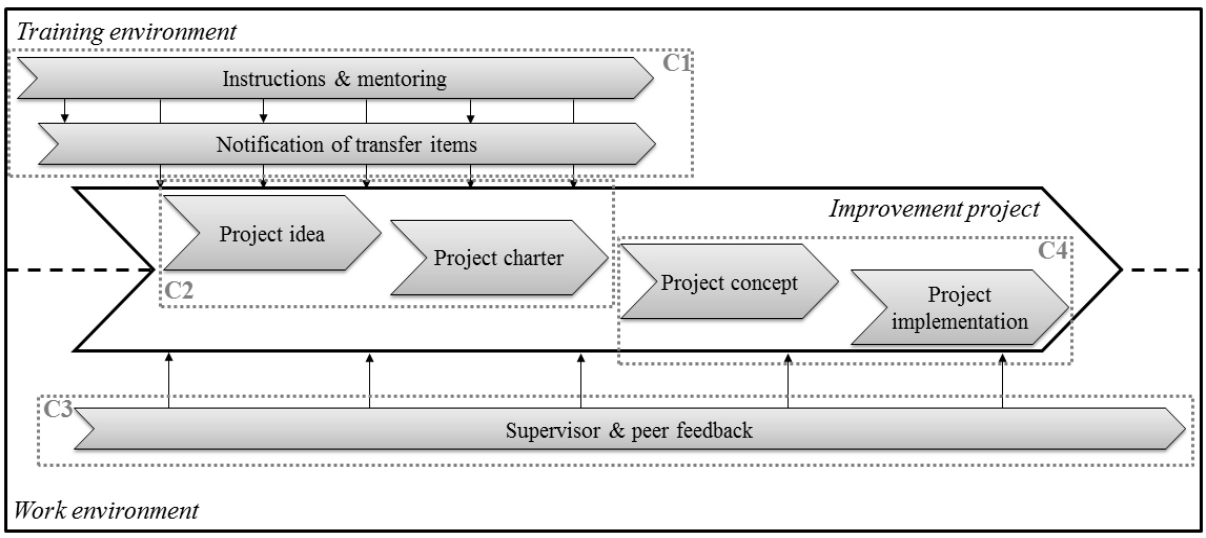

Figure 14: Context of use of transfer-supporting IT components (Amrou et al. 2015)

As of now, we concluded three formative evaluation iterations to improve the transfer-supporting IT components prototype. In the first iteration, blueprints of the transfer-supporting IT components were formatively evaluated in a workshop with four domain

experts. In the second iteration, we evaluated mock-ups of the transfer-supporting IT components in a formative way during two independent expert workshops with four and two domain experts. In the third iteration, a partial prototype was formatively evaluated with both domain experts and participants. We conducted six in-depth interviews with program managers and trainers of corporate training services. Moreover, we presented the partial prototype to seven participants of a national corporate training service and collected their feedback in in-depth interviews. Based on the findings of the third formative iteration, we developed a fully functional prototype. Currently, this prototype is subjected to a summative evaluation that seeks to determine the usability and effectiveness of the transfer-supporting IT components.

For further information about the transfer-supporting IT components prototype we refer to Amrou et al. (2015) and Amrou et al. (2013).

11.3 Research Design

Our goal is to assess the extent to which software supports IT-supporting functions of transfer-of-training. We are primarily interested in learning management systems but add project management systems, because they could potentially support transfer-of-training, too. As a result, we evaluate (1) a learning management system, (2) a project management system, and (3) an existing prototype of the transfer-supporting IT components. The prototype has been implemented to evaluate the transfer-supporting IT components in a summative manner (Amrou et al. 2015) and serves as a controlling instance in this study.

Kumar et al. (2011) made a comparative study between leading learning management systems. Among others, architecture aspects respectively learning and support functions of the learning management systems are compared. According to the comparative study Desire2Learn (2015), Moodle (2015), ANGEL (2015) und Sakai (2015) feature the majority of learning functions. Desire2Learn, KEWL (2015), ANGEL, Moodle, Caroline (2015), OLAT (2015), and Sakai provide the most of the support functions. With respect to the results of the comparative study it can be emphasized that the learning management systems Desire2Learn, ANGEL, Moodle, and Sakai feature nearly every function that is conceivable today. Capterra (2014) periodically creates a ranking of 20 learning management systems that is measured by a combination of their total number of customers, active users, and online

presence. The last ranking was carried out in 2014. In this ranking, representatives of the four mentioned learning management systems are Desire2Learn (1100 customers, 15 billion users) and Moodle (87,084 customers, 73,753,035 users). Based on this ranking we choose Moodle as the learning management system evaluation candidate in this study.

In a study Cicibas et al. (2010) analyzed latest project management systems and compared these systems using a set of 17 criteria. Collaboration, project reporting, and web-based accessibility were criteria among others. According to the comparison, the project management systems Basecamp (2015), ArtemisViews (2015), Primavera (2015) as well as LiquidPlanner (2015) provide the majority of compared capabilities and a native web-based interface. In addition to a ranking of learning management systems, Capterra (2014) periodically creates a ranking of 20 project management systems. This ranking is also measured by a combination of their total number of customers, active users, and online presence. Basecamp (285,000 customers, 15,000,000 users) is the only web-based project management system that is represented in the ranking. Therefore, due to the higher amount of customers and users we choose Basecamp as the web-based project management system evaluation candidate.

There are various approaches to evaluate software products (Baumgartner et al. 2004). Most prominent ones are criteria checklists, comparison groups and expert opinion. We adopt the criteria checklist approach by Scriven (1991). For this, we utilize the capabilities of transfer-supporting IT components as evaluation criteria. The functions of these transfer-supporting components represent design knowledge acquired by the researchers in a design research project (Amrou et al. 2015). We summarize the findings of this research in the above section (cf. table 9). Every function of a transfer-supporting IT component equals an evaluation criterion.

For each function of the transfer-supporting IT components we propose how each software product can be utilized to fulfill the functions required by transfer-supporting IT components. In order to comprehend how the evaluation candidates can be utilized for this purpose, we accessed free accessible demo instantiations of the evaluation candidates that are offered by the providers on their website. Furthermore, we analyzed the documentation of every candidate. Finally, we were able to assess to which extent the software products fulfills the required functions for supporting transfer-of-training. In case the software product fulfills the

evaluation criterion without workaround the criterion is considered to be fully supported. If fulfilling the criterion only by applying a workaround the criterion considered to be partially supported. Based on the findings of the evaluation we derive and discuss research as well as development opportunities for learning management systems.

11.4 Findings

To study the extents of transfer-of-training support by learning management, transfer-supporting IT components are mapped to the evaluation candidates in table 10. As transfer-of-training can be fostered by work-embedded projects, we contrast our findings with an assessment of a project management system. Such a system could be an alternative for supporting field projects in the work environment. Furthermore, we describe how each evaluation candidate can be utilized to fulfill the evaluation criteria:

- **Fully supported:** evaluation candidate meets the criterion without workaround.
- **Partially supported:** evaluation candidate meets the criterion only by applying a workaround.
- **Not supported:** evaluation candidate does not meet the criterion.

The description of the evaluation candidate application and the rating for every corresponding transfer-supporting IT component function is described in table 10.

	Functions of component	**(1) Learning Management System Moodle**	**(2) Project Management System Basecamp**	**(3) Transfer supporting IT components Prototype**
C1	*Transfer Journal*	**Fully supported** Provides feature to create a blog entry or assignment to capture transfer related content and methods. Both opportunities provide a comment function to give feedback.	**Fully supported** For each project a text document or message can be created to capture transfer related content and methods. Files can be uploaded and commented.	**Fully supported** Participants can note information out of the training within the project charter to connect their project ideas with the training content. A comment function for feedback is available.

C2	*Knowledge Assets*	**Partially supported** Files can be uploaded with private file base of the user, course file base, assignment or workflow. Reference to the project only with hyperlinks. No comment function in private file base.	**Not supported** Provides a file upload feature for each project. Every file can be commented. There is no central file base to provide course content.	**Fully supported** Knowledge assets can be created to give the opportunity to easily access and reference training materials related to the project from a central file base. Each knowledge asset can be commented.
	KPIs	**Not supported** KPIs can only be captured through text-editors or uploaded files. No tracking possible. Feedback possible.	**Not supported** KPIs can only be captured through text-editors or uploaded files. No tracking possible. Feedback possible.	**Fully supported** KPIs can be captured for each project. Tracking is possible through the project charter and overviews. A comment function to give feedback for each KPI is offered.
	Milestones	**Partially supported** Only by calendar feature of the course. No direct reference to the project. References have to be made by hyperlinks. Course calendar contains all milestones of all projects.	**Fully supported** Calendar feature for every project available to create milestones of a project. Each milestone can be commented to give feedback	**Fully supported** Milestones can be created and described within each project charter. Each milestone can be commented to give feedback.
	Project documenta-tion	**Partially supported** Projects can be documented in a blog entry or assignment. Knowledge assets, KPIs, and other sections can be linked through hyperlinks.	**Fully supported** A project is a root item. Sections of the project can be created as text documents or messages. Every section can be commented.	**Fully supported** Projects are documented in the project charter. All sections are in a single overview. Each section can be commented to give feedback.

C3	*Project review and authorization*	**Partially supported** Reviews of the project charter can be written as comments. Within the comment text the project can be declined or accepted. By accepting the project through the review participants get their authorization. The owner of the project charter can get a notification if he subscribes the comment area of the blog entry.	**Partially supported** Reviews of a project charter can be written as text documents or messages. Within the text document or message title a project can be accepted or declined. Email notifications can be used to inform the participant. Unfortunately, there is no fine graded notification system.	**Fully supported** Provides mechanisms to review a project charter. Decision (accept, decline) can be chosen within the review form. Project ideas as well as project charters can be accept or declined. Review decision is automatically set to the project. Actors can be invited to write reviews. The participant gets a notification by review completion.
	Detailed feedback function	**Partially supported** Each section of a project charter has to be captured within one blog entry or assignment to have this opportunity. Feedback can be made by the comment function of the blog entry. Navigation to each section is time-consuming.	**Partially supported** Every section has a comment section. Owners or interested users can subscribe for notification. Navigation to each section is time-consuming.	**Fully supported** Each section of a project charter has a comment area that can be directly reached. Owners or interested users can subscribe for notification.
	Regular feedback cycles	**Partially supported** Triggered through the calendar feature. Each project is manually linked to the event. Notifications if blog entries, calendar entries or assignments are commented. No overview.	**Partially supported** Each project has a calendar feature that can be utilized to ensure a regular feedback cycle. No overview. No central calendar to coordinate the feedback cycle.	**Fully supported** Regular feedback cycles are triggered through the generation configuration of a course. Feedback and review overview available. Notification can be subscribed.

C4	*Responsive light weight web-based service*	**Partially supported** Is responsive and web-based; due to a large amount of features not really light weight.	**Fully supported** Provides a responsive light weight web interface.	**Fully supported** Provides a responsive light weight web interface.
	Easy access to stakeholders	**Partially supported** Stakeholders of the project can be integrated within the course as users. Further contact information can be found in the user profile. References to projects only hardly traceable.	**Partially supported** Stakeholders of the project could be integrated. Only the owners can grand access to the project.	**Fully supported** Stakeholders of the project are integrated and referenced to each project charter. An overview of the referenced projects can be found in the user profile. Through a tag function competency of each user is visible.
	Tracking of measureable improvements of improvement project	**Not supported** Only text can be capture within text-editors or files. Due to this it is not possible to track automatically.	**Not supported** It is possible to capture improvements over a to-do list. It is not possible to track automatically.	**Fully supported** It is possible to capture measurable improvements. Tracking is possible for stakeholders.
	Regular traffic-light-report on improvement project	**Partially supported** Reports can be created with a blog entry or assignment. Trend and status can be captured within the text. The report dates can be set by the course calendar. Notification is possible. Monitoring through supervisors time consuming.	**Partially supported** It is possible to create reports through text documents or messages. Trend and status can be captured within the text of the report. Notification hardly possible. Monitoring through supervisors time-consuming.	**Fully supported** Reports can be created for each project charter. Trend and status of the report can be set. The report dates are visualized within the project charter and set for a course generation. Notification is possible. Monitoring through project list available.

Table 10: Mapping of transfer-supporting components to evaluation candidates

The mapping in table 10 indicates that learning management systems do not fully support the evaluation criteria of the transfer-supporting IT components. Knowledge assets (C2), milestones (C2) project documentation (C2), project review & authorization (C3), detailed feedback function (C3), regular feedback cycles (C3), responsive light weight web-based service (C4), easy access to stakeholders (C4), and regular traffic-light-report on improvement projects (C4) are only partially supported. KPIs (C2) and tracking of measureable improvements of improvement projects (C4) are not supported. The transfer journal (C1) is in fact the only evaluation criterion that is fully supported.

The findings indicate that the greatest challenge of learning management systems is to integrate improvement projects. This becomes particularly apparent, as there is a lack of interactive integration of elements of an improvement project like a project charter. Moreover, project review and navigation features are missing. Finally, an opportunity to track key performance indicators is also missing, due to the fact that integer values cannot be captured. On the other hand, our findings reveal that learning management systems do have adequate capabilities to provide contextual training content and discussion functions. Hence, the learning level of the transfer-of-training proposed by Baldwin and Ford (1988) is supported. Unfortunately, this is not yet the case with regard to the transfer level.

Despite the growing prevalence of project-based business and lifelong learning, according to table 10 support for transfer-of-training by project management systems is not fully supported. Surprisingly, project management systems seem to provide more transfer-supporting IT components than learning management systems. In contrast to learning management systems milestones (C2), project documentation (C2), and responsive light weight web-based service (C4) is fully supported. However, they lack the integration of course material (knowledge assets, C2) and administration, the possibility to capture measureable improvements (C4), and the initiation of regular feedback cycles along with review cycles (C3). As a consequence, project management systems provide inadequate support for learning and transfer-of-training.

11.5 Discussion: Research & Development Opportunities for Learning Management Systems

Previous research reveals that improvement projects supported by transfer-supporting IT components are a promising approach to improve transfer-of-training (Amrou et al. 2015). The approach ensures that training content and support is utilized on the job and that the value of a corporate training service is explicated. The maturity of the approach is demonstrated through three formative evaluation iterations and the use in a strategic HR development program of a global manufacturing company. According to researchers, participants have to learn training content and methods in order to transfer them to the workplace (Baldwin and Ford 1988). A learning management system is a solution that handles all aspects of the learning process. Training content delivery, course administration, skills gap analysis, tracking and reporting of learning are provided by learning management systems (Gilhooly 2001). Hence, a learning management system is a perfect foundation for transfer-supporting IT components. As our findings reveal, too many workarounds are needed and functions are not supported yet to utilize transfer-supporting IT components in a learning management system.

The integrate of project support in learning management systems would ensure that training content and support is utilized on the job, just as transfer-supporting IT components do. In addition, value of a corporate training service would be explicated. The reflection of important training content in specific improvement projects would leverage the application of new competencies. Developed and documented transfer-related projects in a structured way would facilitate the easy integration of stakeholders. Furthermore, it would simplify to request and receive feedback from stakeholders and provide feedback to peers. In addition, the authorization of the improvement projects would be facilitated. The communication of the project status and improvements to supervisors and interested colleagues would enhance the peer and supervisor support. Finally, the training evaluation by the service provider and customer would be facilitated, to improve the training constantly.

To realize this opportunities learning management systems should provide functions to add adequate overviews of data, to structure content items as deeply as a project-based approach (work environment) requires, to reference owners and other roles to this content items, to subscribe notifications for every content item, to integrate object types like integers, to

measure those integer values, to gather content items on a single page, to reference training content to activities of the project (work environment) and to create workflows in which these content items can be used (e.g. review). Taking this into consideration work environments could be created within learning management systems that are closely linked to the learning environment, just as transfer-of-training reveals (Baldwin and Ford 1988).

For historical reasons the majority of learning management systems utilize the asynchronous virtual classroom metaphor (Hiltz 1994; Papastergiou 2006). A system that integrates the virtual classroom metaphor provides opportunities for teaching and learning, beyond the physical limits of the traditional classroom walls (Hsu et al. 1999). In fact, features of a physical classroom have been transferred to a virtual classroom with improved features. A virtual classroom supports active learning by providing an environment with learning tools, learning materials, and opportunities for contextual discussion (Yang and Liu 2007). Learning tools, materials, and discussions are structured throughout virtual classrooms and course-rooms, as it is also realized by Moodle (Frank-Voutsas 2012).

Our study indicates that a substantial obstacle to support transfer-of-training with learning management systems is the utilization of the virtual classroom design metaphor as a foundation. The extents to what learning management systems support transfer-supporting IT components and their utilization in a project-based approach demonstrates this substantial obstacle. It is not possible to integrate project support into a system that integrates the virtual classroom metaphor. The metaphor is limited to a flat structure of classrooms as well as courses. This unnecessarily restricts the scope of action by participants.

With respect to corporate training services companies seek to improve business performance following the training (Saks and Burke 2012) which is positively related to transfer-of-training and a key output of corporate training services (Saks and Burke-Smalley 2014). However, the participants are not located in a (virtual) classroom following the training, but rather back to the environment of their specific job. Hence, opportunities to integrate their specific improvement projects (or work environment) with learning content and tools in one virtual environment are required. This indicates that the design metaphor of learning management systems should not be limited to a virtual classroom or course-room. Hence, there is a need for a quest for a better design metaphor for learning management systems, to be able to improve transfer-of-training output with learning management systems.

11.6 Conclusion and Limitation

In the course of this paper we identified to what extent learning management systems and project management systems support transfer-of-training. To do so we evaluated how well identified software products of learning management systems and project management systems can be utilized to fulfill our evaluation criteria. Transfer-supporting IT components were utilized as the evaluation criteria that were developed in a process of theory-driven design and industry requirements.

Moodle was identified as the leading learning management system that provides the majority of functions, users and costumers. Moreover, we identified Bootcamp as the leading web-based project management system with the same characteristics. It is striking that project management systems support transfer-supporting IT components better than learning management systems do. In fact, both systems do not support all transfer-supporting IT components but learning management systems do provide must-have functions for learning such as the delivery of course material and administration. Hence, we recommend to utilize learning management systems as a foundation to develop transfer-supporting IT components.

Furthermore, we discussed research and development opportunities for learning management systems that were inspired by the findings of the evaluation. The findings indicate that particularly project management functions should be integrated into learning management systems to fully support transfer-supporting IT components. This recommendation is only limited to the project-based approach. There might be other approaches with different requirements. Therefore, we provided some development opportunities that are not limited to a single approach. Lastly, we identified that the asynchronous virtual classroom metaphor is a substantial obstacle of learning management systems. We recommend not to limit the design metaphor of learning management systems to a virtual classroom and ask for a quest for better design metaphor in future design research for learning management systems.

Nevertheless, there are specific software products available that are specialized to improve the transfer-of-training. Unfortunately, they are not open source and a request to evaluate the software was not answered. Therefore, we could not include these software products in this study. However, a study of the product websites indicate that the focus is more on the monitoring of qualification as well as training and less on the support of transfer-of-training related to the work environment. Furthermore, the components utilized as evaluation criteria

aim to leverage the work environment but there are other determinants that can also affect transfer-of-training output.

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12 Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services

Amrou, S., and Böhmann, T. 2016. "Design and Evaluation of Transfer-Supporting IT Components for Corporate Training Services," in *Proceedings of International Conference on Information Systems (ICIS)*, Dublin.

Abstract

Corporate training services have grown into a key approach for improving business performance and a substantial industry in recent years. Transfer-of-training is a key output of these services, defined as the application and generalization of new competences at work acquired in training. Researchers have shown that participants apply only few of their learnings at work following training. Thus, corporate trainings seem to suffer from low productivity. IT could be an enabler to embed transfer-related activities to transfer training contents to the work. However, IT support is missing to improve transfer-of-training output of corporate training services. Based on training research and inspired by service logic, the design science research paradigm is utilized to iteratively design transfer-supporting IT components which leverage IT to influence known determinants of transfer-of-training to improve the transfer-of-training output of corporate training services. The final naturalistic evaluation reveals that the components improve the transfer-of-training output of these services.

Keywords

Transfer-Of-Training, Design Science Research Methodology, Naturalistic Evaluation, Complex Service System

12.1 Introduction

Changing job profiles and competencies are key drivers of the rising prevalence of knowledge-based work and lead to more participation in lifelong learning (Eurostat 2012). Customized corporate training services are key contributors to lifelong learning (Salas et al. 2012; Zolnowski et al. 2013). More than 94 % of major companies use corporate training services in 2010 (Vollmar 2013). In Germany, companies spend €28.6 billion (Seyda and Werner 2011) and in the United States approximately $164.2 billion in 2012 on corporate training services (Miller 2013). Thus, seeking to ensure that training leads to improved business performance (Saks and Burke 2012). A key output of a corporate training service is transfer-of-training that is positively related to business performance (Saks and Burke-Smalley 2014). Transfer-of-training is generally understood as the effective application, generalization, and maintenance of knowledge, skills, and behavior by participants from the training to their work context (Baldwin and Ford 1988). However, there is a transfer-of-training related problem as only few participants apply their learnings effectively on the job (Baldwin and Ford 1988; Saks and Belcourt 2006; Saks et al. 2014). This is a serious problem as it indicates that participants are failing to change their behavior and improve performance on the job, such that corporate training is unlikely to affect business performance (Kozlowski et al. 2000). Thus, corporate training services seem to suffer from low productivity.

Product-centered thinking about productivity has a limited value when applied to service (Grönroos and Ojasalo 2004). Providers unrelated to customers cannot manage service productivity as customers provide critical inputs, collaborate with providers in creating value, and accrue benefits from the service (Grönroos and Ojasalo 2004). Therefore, customers need to be involved in the value co-creation process along with the capability to align the service value in the individual contexts (Bitzer and Söllner 2013). Corporate training services are specific instances of highly co-created services and are often provided internally or outsourced (Frankhauser 2005). Training is organized and designed as a systematic series of activities to improve an individual's job related knowledge, skills, understanding, motivation, and job performance (Goetsch and Davis 2010; Skinner 1968). Collaboration between training customers and providers as well as contextualization to meet the individual training needs is required to achieve this output (Bitzer and Söllner 2013). Research on transfer-of-training emphasizes this need for contextualization and collaboration (Grossman and Salas 2011).

Information technology (IT) can facilitate the co-creation of value through contextualization and collaboration (Böhmann et al. 2014). IT particularly can provide a bridge between the context of training to context of work across differences in time and space. Yet, IT support for transfer-of-training has not been sufficiently addressed in research (Bates 2005; Hoic-Bozic et al. 2009), despite the potential for blending training and work as well as the growing prevalence of IT-supported learning in corporate trainings (Arthur Jr. et al. 2003). Also learning management system do not yet provide support for transfer-of-training (Semmann et al. 2012), despite having become widely tools for corporate training services (Bradstreet 2012). Thus, this research seeks to effect improvements in the productivity of corporate training services by strengthening their transfer-of-training output through transfer-supporting IT components. Hence, the research objective is to *design transfer-supporting IT components that improve the transfer-of-training output of corporate training services.*

In order to fulfil our research objective, this research first introduces the research design and then adapts the activities of the design science research methodology (DSRM) by Peffers et al. (2007) as the structure of this paper (cf. figure 15). First, the (1) *identify problem & motivate* activity is discussed. Afterwards, this paper present the (2) define *objectives of a solution* activity. In the following, we present the (3) *design & development* of the components. Thereafter, we summarize the (4) *demonstration* of use of this research work. As a next step, we discuss and summarize the results of the naturalistic (5) *evaluation*. The paper closes with a conclusion and limitation.

12.2 Research Design

This research follows the design science paradigm by Hevner et al. (2004) that introduces principles for the scientific construction of innovative artifacts, in order to design the components and their utilization. The final design artifact of this research is an instantiation (March and Smith 1995) which is based on training research and inspired by service logic. For the iterative design and development of the artifact we adopt DSRM by Peffers et al. (2007) as a instantiation of the design science paradigm (cf. figure 15).

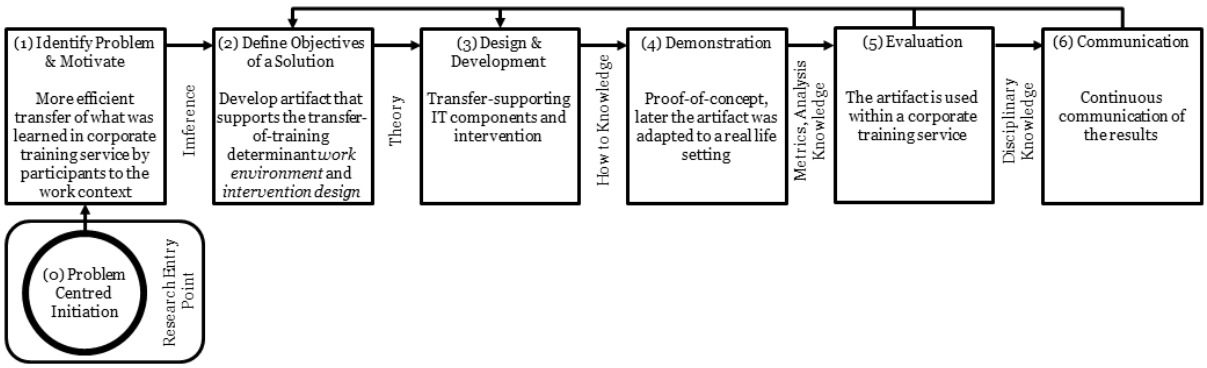

Figure 15: Adapted DSRM by Peffers et al. (2007)

The DSRM is a widely accepted and applied methodology for conducting design science research in the domain of information systems. As the DSRM is an iterative process, and evaluation and communication activities can initiate iterations, this paper builds on previous iterations and publications (cf. table 11). Feedback on earlier design iterations as well as feedback received through academic peer-review and discussions provided input to new iterations of the DSRM. Previous work documented the (0) *problem centered* initiation as we identify a practical problem and theoretical foundations for the design of a problem-solving instantiation and justify the contribution of a novel solution in the light of prior research (Amrou et al. 2013; Semmann et al. 2012).

Author (year)	**Iteration: Objective source**	**Design type**	**Demonstration type**	**Evaluation type / Data acquisition**
Amrou et al. (2013); Semmann et al. (2012)	1: Theory V1	Conceptual Model V1	*Proof-of-concept with experts*	*Artificial / In-depth interviews*
Amrou and Böhmann (2015); Amrou et al. (2015)	2: Theory V1 & Practical V1	Conceptual Model V2	*Proof-of-concept with experts*	*Artificial / In-depth interviews*
	3: Theory V1 & Practical V2	Instantiation V1	*Proof-of-concept with experts and end users*	*Artificial / In-depth interviews*
	4: Theory V1 & Practical V3	Instantiation V2	*Proof-of-concept with experts and end users & Theoretical proof-of-concept*	*Artificial / In-depth interviews*

This research work	5: Theory V2 & Practical V4	Instantiation V3	*Proof-of-concept with experts and end users & Use in real life setting*	*Naturalistic / In-depth interviews & Analysis of use*

Table 11: Iterative design & development of transfer-supporting IT components

We then (2) *define objectives of a solution* and discuss the iterative (3) *design & development* of the artifact until the fourth iteration in Amrou et al. (2015). In addition, we present a proof-of-concept for the (4) *demonstration* of use in further studies and the extent to what the transfer-supporting IT components differ from existing learning solutions (Amrou and Böhmann 2015; Amrou et al. 2015). This research introduces the instantiation to a global corporate training program for a demonstration of use and naturalistic evaluation. In this paper we summarize the progress of the DSRM and discuss the final (4) *demonstration* of use and naturalistic (5) *evaluation*. (6) Communication activities as explained above. The methodology of each DSRM activity is initially discussed in the corresponding section, with the exception of activity 0 introduction and 6 communication (cf. table 11).

12.3 Identify problem and motivate

Transfer-of-training is a key output of corporate trainings and is positively related to business performance (Saks and Burke-Smalley 2014). Researchers reveal that there is a transfer-of-training related problem because only few participants apply their learnings at work (Baldwin and Ford 1988; Saks and Belcourt 2006; Saks et al. 2014). Hence, corporate trainings seem to suffer from low productivity.

An interdisciplinary and comprehensive literature review identifies the problem more in depth (Amrou et al. 2013) following the guidelines given by Webster and Watson (2002. In the course of the literature review this research identifies that the transfer-of-training theory by Baldwin and Ford (1988) is generally accepted in the research domains. Moreover, the review identifies empirically supported determinants that affect the transfer-of-training output of corporate trainings. These are *learner characteristics*, *intervention design*, and *work environment* (Alvarez et al. 2004; Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997). *Learner characteristics* refer to personal traits of the participants. The *intervention design* refers to principles of learning, sequencing of training activities, and

training content. Finally, the *work environment* determinant reflects the level of support the participant receives when acquiring and using new competencies at work. Moreover, this determinant refers the extent to which the participant has the opportunity to use and practice learnings acquired in training at work. The determinants have direct and indirect effects on transfer-of-training output. All determinants have indirect effects on the transfer-of-training output. In order to transfer new competencies they must be initially learned (Kirkpatrick 1967). *Learner characteristics* and *work environment* have direct effects on the transfer-of-training output regardless of the initial learning during the training program. Thus, for example, a lack of supervisor support (*work environment*) may lead the participant to not maintain well-learned skills on the job. For a detailed summary of all factors we refer to the detailed literature review (Amrou et al. 2013). All factors of the *work environment* and *intervention design* determinants that informed the design of the components are be explained in the section "Design & Development".

Extant research has not yet addressed the use of IT to improve these known determinants of transfer-of-training (Bates 2005; Hoic-Bozic et al. 2009), although IT has the capabilities to bridge differences in time, location, and context. Even learning management systems that are commonly used to support corporate training services (Bradstreet 2012) lack support for transfer-of-training (Amrou et al. 2013; Semmann et al. 2012). We thus derived the motivation for the design research project from having identified a highly relevant problem and a clear design research gap.

12.4 Define objectives of a solution

According to Peffers et al. (2007) this activity requires researchers to infer the objectives from the problem definition and existing knowledge. In addition, Hevner et al. (2004) require researchers to build on prior research for advancing design knowledge. To fulfill these requirements and to translate the identified problems into initial objectives of our solution, this research adopt theory-driven design that has been proposed by Briggs (2006). Briggs advises design researchers to determine an output variable they seek to change and to search for a guiding theory that helps to understand causal relationships related to the chosen output variable (Briggs 2006). The design should build on these relationships by designing artifacts that influence the theoretically identified determinants of the chosen output variable. This research follows this reasoning by choosing transfer-of-training as the intended output

variable and utilizes the identified transfer-of-training determinants as theoretical guidance (Amrou et al. 2013).

Research has clearly demonstrated the critical role of the *work environment* determinant (Burke and Hutchins 2007). Yet, this determinant has barely been addressed in recent literature and no research has so far sought to leverage IT for positively influencing factors of transfer-of-training related to the *work environment*. Since IT can help bridging the gap between the training and the work context, our initial objective was to design IT components that positively influence factors related to the *work environment*. *Work environment* subsumes factors that are inherently socio-technical and have direct effects on the transfer-of-training output (Alvarez et al. 2004; Baldwin and Ford 1988; Burke and Hutchins 2007; Ford and Weissbein 1997). IT can support embedding corporate trainings into the work context, thus providing a powerful bridge from the training to the work of the participants. Therefore, the *work environment* determinant is promising to improve the transfer-of-training output of corporate training services.

Beside these theory-based objectives of the first iteration and the practical objectives of iteration two to four (Amrou et al. 2015), the fourth iteration of the DSRM yields further theory-based objectives. The introduction of the components into the training and work emphasizes the need for more attention to social-technical issues during the design and development. Therefore it is necessary to consider the *intervention design* that inter alia refers to the sequencing of training activities and thus, provides a frame to adequately integrate the use of the components within the corporate training service. For the application and generalization of new competences acquired in a corporate training, it is necessary that a training program is closely linked to the participants work. So we added a design objective by also seeking to influence the *practice and feedback* factor of the *intervention design* determinant. The *practice and feedback* factor gives participants intersect opportunities to utilize what was learned already during the training intervention. Lim and Johnson (2002) found that participants will perceive higher transfer-of-training if the intervention matches departmental goals. Moreover, realistic practice scenarios help to maintain the participants attention and influences transfer-of-training (Burke and Hutchins 2007). Thus, we design (1) transfer-supporting IT components that influence the empirically proven (2) factors of the transfer-of-training related to the *work environment* determinant and *(3) practice and*

feedback factor of the transfer-of-training *intervention design* determinant in order to improve the (4) transfer-of-training output of corporate training services (cf. figure 16).

Ideally, we would have been able to also influence *learner characteristics*. However, as the specific setting of our design research project is a global corporate training service the field partners defined factors related to *learner characteristics*, such as training objectives and participants. Hence, this research had no opportunity to influence the *learner characteristic* determinant of transfer-of-training. This is a limitation of our research that we discuss further in the conclusions and limitations section of this paper.

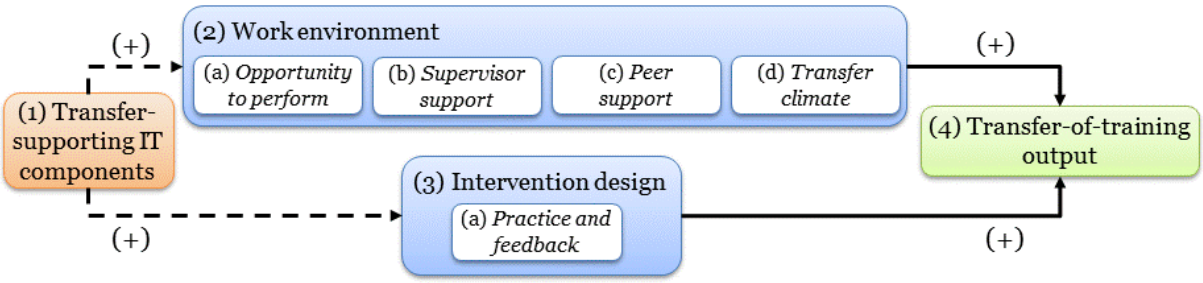

Figure 16: Theory-based design of the components (extended from Amrou et al. (2015))

In addition to these theory-based objectives, the fourth iteration yields further practical objectives. Participants will only have to use the components if they develop their project. Hence, it takes a long time to learn how to handle the components. Moreover, the acceptance to use them only to create projects and communicate elsewhere is possibly low. Therefore, it is a further objective to establish the components as a key hub of the training. More opportunities of value creation should lead to a higher acceptance to use them. Since additional functions are iteratively integrated into the components, it became increasingly difficult to navigate. Therefore, the navigation has to be simplified. Furthermore, the regular feedback cycles initiate changes by participants. By now it is not clear why a change occurs and which feedback initiates the change. Hence, a further objective is to enhance clarity of project documentation changes as a result of feedback. Finally, the project review and authorization function has no opportunity to provide detailed feedback. In addition to this function a supervisor has to utilize the detailed feedback function. Moreover, it is not possible to invite users to reviews. The resulting feedback of regular feedback cycles is not aggregated in one review. These circumstances lead to high efforts in providing and retracing feedback. Hence, a further objective is to decrease the effort in providing and retracing feedback.

12.5 Design & Development

Guided by the underlying theory, the *design & development* of this research follows an iterative search for the design of the artifact. This approach leverages discussions with the target audience thus improving the applicability and utility of the artifact for end users (Hevner et al. 2004). Each iteration results in a refined artifact that reflects the realization of further theory-based or practical objectives (cf. table 12).

Reference	(Iteration) Artifact type: Description
Amrou et al. (2013); Semmann et al. (2012)	**(1) Conceptual Model V1:** Theoretical concept for project documentation, Detailed feedback function, regular feedback cycles, KPIs, tracking of measureable improvements of improvement project, and milestones
Amrou and Böhmann (2015); Amrou et al. (2015)	**(2) Conceptual Model V2:** Improved Conceptual Model V1 plus mock-ups.
	(3) Instantiation V1: Instantiation of functions of conceptual model V2. Theoretical concept as well as mock-ups for project review and authorization function, responsive web-based service, knowledge assets, and easy access to stakeholders.
	(4) Instantiation V2: *General improvements of instantiation v1 plus* additional functions: transfer journal, regular traffic-light-report, and fine-grained notifications.
This research work	**(5) Instantiation V3:** Substantial redesign of regular feedback cycles, project review and authorization, milestones, and fine-grained notifications compared to instantiation v2 plus additional functions: instantiation of prior improvement project listing, training content, feedback aggregation, forum, dashboard, announcements, versioning system, tab-structure for training generation, intervention customization, intervention integration, intervention status, messaging, landing page, and event calendar.

Table 12: Iterative design & development of transfer-supporting IT components

The resulting artifact in this research is a conceptual model for the first three iterations, followed by a instantiation for the later iterations (Hevner et al. 2004). As table 12 shows, we moved through two conceptual models and two instantiations. In each iteration, we improve the instantiation by redesigning functions, adding of further functions, and integrating the *intervention design* into the components in iteration five. See table 13 for a summary of components functions and factors of the *work environment* and *intervention design*

determinant. A component aggregates functions for a specific project setting and phase. As a function supports and influences a factor of a transfer-of-training determinant. Lastly, a factor, as part of a determinant, influences the transfer-of-training output of corporate training services.

Determinant and factor	**Description of factors**	**Functions of transfer-supporting IT components**
Work environment - *Opportunity to perform* (cf. figure 16, factor 2a)	Possibility of participants to utilize training content and learnings at work (Brinkerhoff and Montesino 1995; Clarke 2002; Lim and Morris 2006).	Transfer journal (C1), Training content (C1)**, knowledge assets (C2), project documentation (C1, C2, C3, C4), project review and authorization (C3)*, regular traffic-light-report (C4), fine-grained notifications (C2, C3, C4)*
Work environment - *Supervisor Support* (cf. figure 16, factor 2b)	Supervisor involvement in process of adapting training content in work environment. Studies show that participation of supervisors in the training program positively affects transfer-of-training output (Brinkerhoff and Montesino 1995; Burke and Baldwin 1999; Clarke 2002; Sookhai and Budworth 2010).	KPIs (C2, C4), milestones (C2, C4)*, project documentation (C2, C4), project review and authorization (C3)*, detailed feedback (C3), regular feedback cycles (C3)*, feedback aggregation (C3) **, versioning system (C2, C4)**
Work environment - *Peer Support* (cf. figure 16, factor 2c)	Support of colleagues at training and work and of other participants at corporate training service (Chiaburu and Marinova 2005; Facteau et al. 1995; Hawley and Barnard 2005). Sharing ideas about different ways of applying training contents on the job improves the transfer-of-training output.	KPIs (C2), milestones (C2)*, project documentation (C2, C4), project review and authorization (C3)*, detailed feedback (C3), regular feedback cycles (C3)*, feedback aggregation (C3), versioning system (C2, C4)**

Work environment - *Transfer climate* (cf. figure 16, factor 2d)	Circumstances at work, where participants have to utilize the training content. A positive transfer climate significantly enhances the effectiveness of interventions and thus the transfer-of-training output (Burke and Baldwin 1999; Richman-Hirsch 2001).	Responsive light weight web-based service, easy access to stakeholders, tracking of measureable improvements of improvement project (C4), prior improvement project listing (C1, C2, C4) **
Intervention design - *Practice & feedback* (cf. figure 16, factor 3a)	Teaching method that supports the transfer-of-training output through the opportunity to utilize what was learned during the intervention (Holladay and Quinones 2003; Lee and Kahnweiler 2000; Salas et al. 1999b; Warr and Allan 1998).	Intervention customization **, intervention status **, intervention integration **
*Function *redesigned or **added function in iteration five*		

Table 13: Component functions referenced to factors of the *work environment* determinant (extended from Amrou et al. (2015)

The adapted *practice and feedback* factor of the *intervention design* determinant of transfer-of-training output provides the participant the opportunity to utilize what was learned during the intervention. In addition, departmental goals and realistic scenarios are considered. Hence, one effective intervention for linking training and work is the use of field projects that guide participants to apply new competences acquired in a training context to achieve improvements in their work context (Bell 2010; Nikandrou et al. 2009; Seethamraju 2012). In this project-based approach, participants are encouraged to develop an improvement project for their specific work setting that leverages the competences acquired in the training program. To integrate this approach into the training program the components are aggregated as follows: transfer preparation (C1), improvement project definition (C2), supervisor and peer support (C3), and improvement project finalization (C4). In order to integrate the intervention design into the components further functions are derived in iteration five (cf. table 13).

Figure 17 illustrates the intervention in which the functions of the components C1 to C4 are used. The design enables participants to transfer their learnings step by step from the training to the work context. A training program includes several courses and an improvement project.

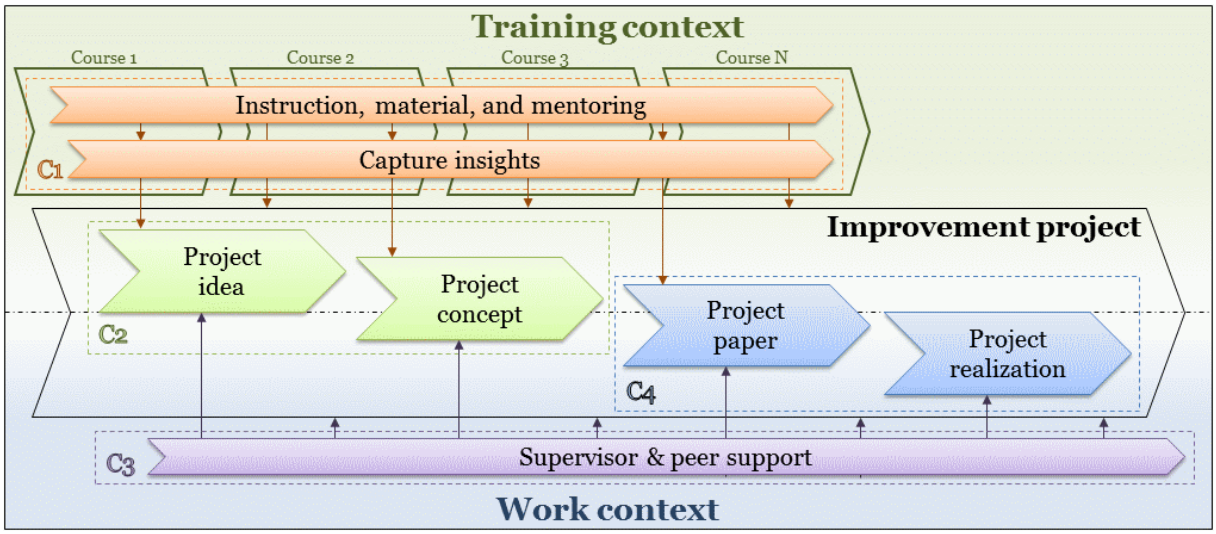

Figure 17: Intervention in which components are used (extended from Amrou et al. (2015))

Figure 18 shows a screenshot of the project documentation in the project concept phase. The project documentation is the center of the components. It helps to define projects in a structured way and enforces an explication of the utility. The project documentation aggregates sections to define improvement projects based on the training content and the work setting. Furthermore, it aggregates information about the project such as stakeholders and the status through the added intervention status function. The added intervention customization function provides the opportunity to configure the project documentation to meet individual intervention designs. This enables the integration of the *practice and feedback* integration into the components. The components are implemented as responsive web-based services that give ubiquitous access to all information needed and to all stakeholders of the corporate training. The instantiation adjusts itself to the IT environment in which the user utilizes the components. Hence, the use of the components by all stakeholders is more likely (*opportunity to perform*). Moreover, the components facilitate the access of external stakeholders (e.g. trainers) to the information as companies are reluctant to grant such access to infrastructure and application systems (e.g. project management software and network). Hence, transfer-supporting IT components provide the opportunity to link the training with the work context to all stakeholders.

Transfer Preparation (C1): During a face-to-face course the trainer instructs the participants with insights and methods the training is about. At the end of each day of the face-to-face course setting, the trainer instructs participants to capture learnings that are relevant to their specific work setting in a *transfer journal.* Thus, these notes reflect ideas for improvements at

work that result from course contents or discussions with peers, supervisors, and trainers during the course. Back at work, participants refer to the transfer journal to apply individual learnings to their improvement project or work setting. After each course, supervisors and trainers are encouraged to discuss the notes with the participant to improve the opportunity to perform. *In the latest instantiation V3*, we added the prior improvement project listing function. This allows participants finding examples how prior participants of the same course applied learnings in their previous projects. We also added a training content function. This enables participants to access training content through the components at work and may ask questions to all actors of the training regarding the utilization of the content.

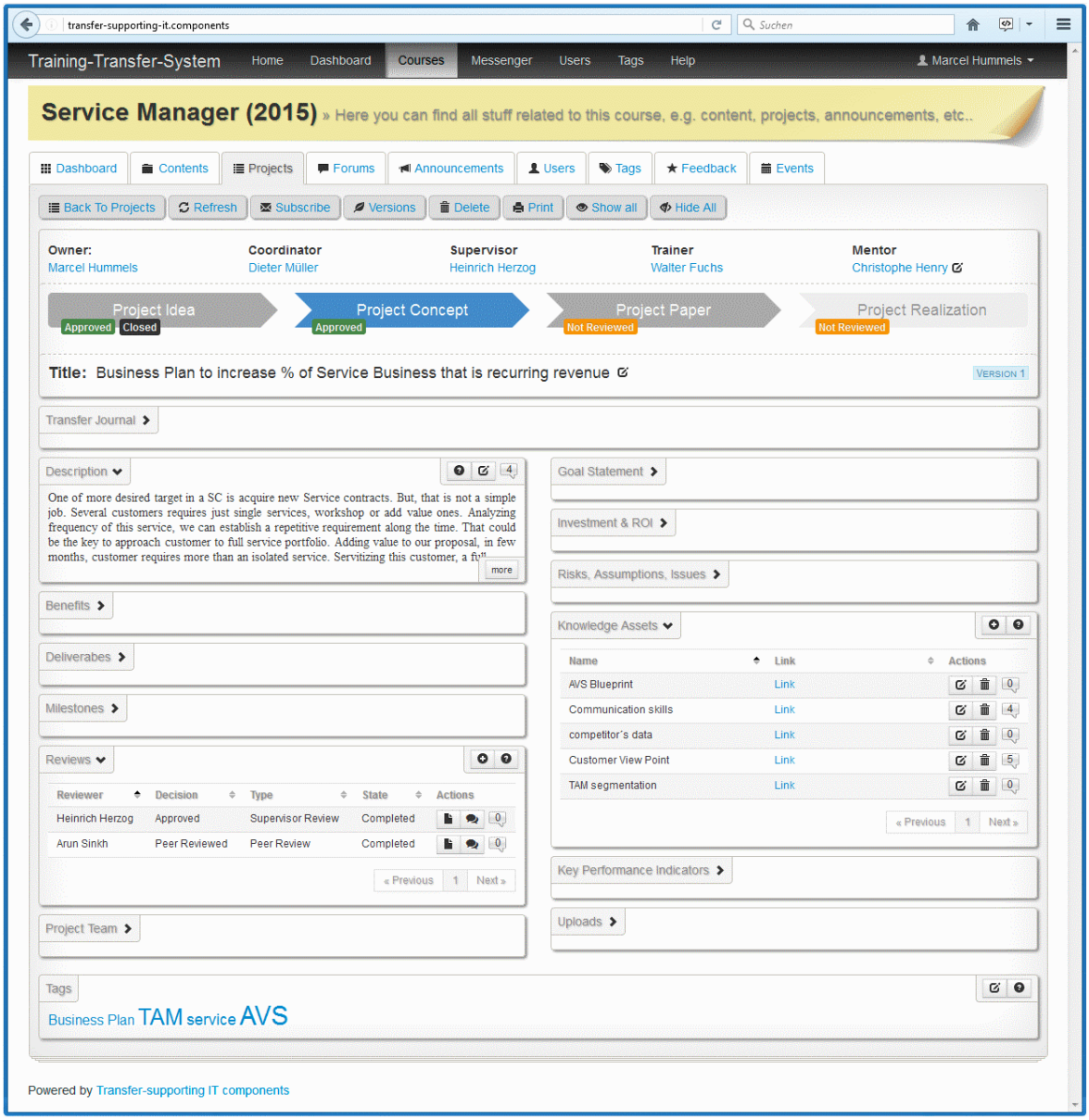

Figure 18: Project documentation screenshot of transfer-supporting IT components

Improvement Project Definition (C2): With reference to their work context as well as the learnings and notes generated by the course, participants develop two initial project ideas. Within the idea phase the participant writes a short description of the project idea. Moreover, the participants can specify knowledge assets that match to the content of the training program so that training materials related to the project can be accessed easily (*opportunity to perform*). This specification of knowledge assets can help to implement the learnings in the actual work context. The resulting ideas are reviewed by a trainer and a supervisor who commits to one of the two ideas. Based on accepted ideas and the feedback, participants document key aspects of the project in the project concept phase. Together with the supervisor, the participant searches for a mentor who has experiences regarding the project topic. From now on, the mentor supports the participant through the components. Subsequently, peers review the project concept. The peer review helps to think outside ones organizational box, potentially creating a big picture of all the projects among all the participants and stakeholders. Also, training participants see further examples how others apply the training content in their project. The supervisor approves the revised project concept. If accepted, the project concept serves as an agreement between all stakeholders of the project. This gives the learner the mandate to implement change in current work practice (opportunity to perform). *In the latest instantiation V3*, we redesigned the project review and authorization function and regular feedback function that are described in C3. These functions can be used to provide substantial feedback on the ideas and provide management support for the selected project. Also the added prior improvement project listing function allows participants finding examples for further enhancing their project idea. Moreover, we redesigned the milestone function. The redesigned function automatically informs the owner and supervisor of the project about overdue milestones. To enhance clarity of project changes as a result of feedback a versioning system is added to the components that provide the participant with the opportunity to create a new project documentation version in each improvement project phase (C2, C4). Furthermore, the redesigned fine-grained notification system informs the participant about each incoming review. In addition, users can subscribe functions such as project documentations, detailed feedback, forums, or training content to receive notifications.

Supervisor and Peer Support (C3): Throughout the improvement project supervisors and peers are encouraged to provide feedback on specific projects. Each section within the project

documentation can be commented, e.g. each knowledge asset, KPI, or milestone etc. In this structured manner it is easily possible for peers as well as supervisors to give feedback. The feedback also serves as a conduit for fostering commitment among the stakeholders for the project. The component encourages supervisors to evaluate projects and provide feedback. Furthermore, the component can require the supervisor to accept or reject proposals and to indicate their sponsorship for individual projects. Thus, encouraging the commitment of supervisors to the project and ensure their ongoing support. Such a formal agreement can also corroborate the opportunity to perform. From the peers' point of view, it is possible to discuss the project and identify barriers, possible problems, and improvements in the project. Finally, the level of involvement of peers is transparent to enable a high visibility towards supervisors. This visibility is a strong incentive for participants to engage in peer support. *In the latest instantiation V3*, we redesigned the project review and authorization function and regular feedback function. A review section is integrated in each project documentation version of an improvement project phase. The review section gives the opportunity to plan reviews and to invite users to supervisor or peer reviews. Invitation notifications by email and reminders on the landing page as wells as on the dashboard ensure that the users get informed. Guided by a wizard the user is encouraged to provide feedback to each section of the project documentation. On the last wizard page the user has to summarize the review. Contrary to the peer, the supervisor has the opportunity to approve the project documentation. This also changes the status of the project phase. By completing the review the owner of the project receives a summary by email. This design can lead to decreased efforts to provide and retrace feedback. Nevertheless, future participants can receive indirect peer and supervisor support. They can easily retrace certain training knowledge and learn from the experiences of prior projects by the added improvement project listing function or find experts for their projects. To foster the support within the components each item or function can be subscribed. As a result subscribers get notified on changes.

Improvement Project Finalization (C4): In order to be able to realize the improvement project, participants develop a project paper based on the project concept. In the project paper phase, the participant has the opportunity to receive support from trainers to develop his or her paper. As a final quality control the trainer reviews the paper for training content being incorrectly applied in the proposed project. This project thus summarizes the final project and the application of training content. Based on the paper the participants realize their

improvement project and use this component to track the progress in terms of development of relevant KPIs and completion of milestones. This high transparency based on KPIs, milestones, and reports helps to make the value of a corporate training more explicit. Supervisors and mentors can monitor the projects for progress and business impact with the help of this component. Besides milestone reports, this component demands regular traffic-light-reports stating the current status of the project as well as problems with the realization of the improvement project. Such issues may signal an incorrect or less useful application of training content or missing training content (opportunity to perform). From a peer's perspective the traffic-light-reports help to learn from other current or past participants of the training. Overall, supervisors can develop an impression about pre- vs. post-training performance. Furthermore, coordinators receive indicators how the training program could be improved. *In the latest instantiation V3*, we redesigned the feedback that occurs through reviews or regular traffic-light-reports by way of individually summarizing the feedback for each user. Finally, a messaging function is implemented to integrate the communication of the training into the components. So that important communication regarding the training does not get lost in the high amount of organizational emails and a dedicated channel to all users following all face-to-face courses of the training is available.

Over the time and with experience, the components can influence positively the expectations regarding corporate training services. This improves the *transfer climate* in a company by providing measureable improvements in work practice as a consequence of the corporate training. This should change the perception and relevance of a corporate training service, in terms of making positive effects of the training visible. This is considered throughout the whole design of the components where clarification of utility is the main focus.

In addition, we derive functions from further practical objectives for the components in iteration five. To minimize the number of tools that are needed for the corporate training and to establish the components as a key hub of the training service with additional value creation opportunities for users, a forum is implemented where users have the opportunity to discuss about training content, courses, methods, insights of their work context. An announcement function is implemented to gather all news of the training program at a single point. The training event calendar provides the users with an overview and insights of upcoming events regarding the intervention, such as the timeslot for the next course or the deadline of project idea finalization. Furthermore, we improved the usability of the components iteration by

iteration. In iteration five, a dashboard that aggregates and links all new information at one place is implemented. In addition, functions and sections of the components for each generation of a training program are bundled by a tab structure. Finally, a landing page is implemented that summarizes and describes the sections of the components at a single point.

12.6 Demonstration

We have demonstrated the use of a designed artifact in each of the iterations to proof that the idea works (cf. table 11). Each artifact was demonstrated to key stakeholders that participate at the global corporate training program. This was done to improve the effective knowledge of how to use the components (Peffers et al. 2007). Moreover, to ensure that key stakeholders are satisfied with the components, in order to enhance user acceptance. Furthermore, we communicated the artifact to researchers to ensure its utility, novelty, and the rigor of the design and to receive feedback for further design iterations (cf. table 11). Following the *design & development* of the fifth iteration all key stakeholders were satisfied with the usability and functionality of the components. As a result, we were able to introduce the components to a real life setting and thus unfold their positive effects on the transfer-of-training output. The following section summarizes how the components were used in the global corporate training program to demonstrate the use to solve the problem (Peffers et al. 2007).

The components were introduced into a global service management training program of a corporate training service provider for a European machine construction company. The training program included several face-to-face courses with an embedded improvement project and was conducted since 2012 four times. The period of the training program was one year in which four face-to-face courses were integrated over time. The duration of each face-to-face course was five days. In the face-to-face courses the trainer instructed the participants with general as well as service management insights and methods, such as Service Blueprint (Bitner et al. 2008), and SWOT Analysis (Helms and Nixon 2010). In the training generation in which the final *demonstration* was conducted, seven participants attended the training program accompanied by two supervisor, a coordinator, three trainers, and seven mentors. This corporate training service has a demanding setting given participants and management stakeholders with high time pressure, challenging business goals, and a worldwide dispersion.

During the initial day of the first face-to-face course the components were introduced into the training and users were instructed how to use them. To foster the learning process in how to use the components, the participants had to create a first project idea and to note the learnings of the course day in the transfer journal. With our support all participants learned how to use the components they need to work with until the next face-to-face course. In addition we provided help documents to the users that explain how the components could be used. The users were instructed to contact the research team for further support. Moreover, the event calendar of the components with additional information about the training program and deadlines of the improvement project were discussed with the participants. Until the end of the first face-to-face course the participants used the transfer journal at lunch break and at the end of the day to note training insights and implications for their own improvement project. For this purpose the trainers provided ten minutes larger modules. Shortly after each course the trainer and a supervisor commented the notes within each transfer journal if necessary. Until the second face-to-face course each of the participants created two project ideas for their work context based on the training content and notes of the transfer journal. During the second face-to-face course the participants used the transfer journal to note learnings again. Furthermore, after the second face-to-face course and until the deadline of the project idea phase the participants further developed their project ideas based on the new captured insights. Subsequently, both ideas were reviewed by a trainer and a supervisor. In addition, the supervisor authorized one project idea of each participant and the coordinator closed the project idea phase within the components. Based on the project idea subject and coordinated with the supervisor the coordinator created peer review invitations with a formal timeslot for all participants. Meanwhile, all participants developed their draft project concept based on the supervisor's feedback and the learnings of the participant gained in the training. During the peer review timeslot participants reviewed the project concept they were invited to. Following the peer review a supervisor review finally appeared. On basis of the peer and supervisor review each participant developed his final project concept. Just before the third face-to-face course the supervisor approved each project concept with additional feedback if necessary. Shortly before the next course the coordinator closed the project concept phase. In the third face-to-face course the participants used the transfer journal again. Following the third course the participants used the components to develop a paper structure based on the concept. A trainer of the training program reviewed this structure. Based on the feedback, structure, and concept each participant developed a document. This document was uploaded to the project

documentation of the paper phase. As a final quality control the trainer commented training insights that were utilized incorrectly in the document and uploaded it. This project paper summarized the final improvement project, the application of training insights, and served as a basis to decide whether the project will be realized or not. At the end of the project paper phase the formal training ended with a presentation of the project to supervisors, trainers, colleagues, and mentors in the fourth course. For those participants who did not realize their improvement project, the final certificate award was the end of the training program. Finally, the participants who realized their project used the project documentation of the realization phase to report the status of the realization to key stakeholders. They reported the status over the regular traffic-light-report every six weeks, changed milestone status if necessary, reported changed KPIs, and deliverables. Supervisors and mentors monitored the projects and gave feedback to the regular traffic-light-reports.

12.7 Evaluation

12.7.1 Evaluation strategy and methods

Peffers et al. (2007) requires researchers to compare the *objectives of the solution* to actual observed results from use of the artifact in the *demonstration*. The existing design science research (DSR) literature identifies a multitude of different evaluation methods (Hevner et al. 2004; March and Smith 1995; Nunamaker et al. 1990; Vaishnavi and Kuechler 2004). However, guidance on choosing an evaluation strategy and adequate evaluations methods is still in its infancy. Thus, the "Framework for Evaluation in Design Science Research" (FEDS) by Venable et al. (2012) is the first comprehensive publication in this regard. While not available at the time when the evaluation started, the enhanced and clarified framework by Venable et al. (2016) provides further help in shaping an evaluation strategy for a design science research project. Both frameworks differentiate evaluation strategies for design science research, depending on contingent factors related to the nature of the design, the research goals, and available resources. Our research addresses a socio-technical design objective and thus involves user-related and social design risks (Venable et al. 2016). Moreover, we seek to show that "…the utility/benefit will continue in real situations and over the long run" (Venable et al 2016, p. 82). In this case, Venable et al. (2016) suggest to follow the „*human risk & effectiveness"*evaluation strategy (Venable et al 2016, p. 82). This evaluation strategy suggests to move from artificial to naturalistic evaluation settings early in

the process. Venable et al. (2012) provide a related recommendation, suggesting multiple iterations with formative evaluation before moving to a summative naturalistic evaluation. Naturalistic evaluation „... explores the performance of a solution technology in its real environment, typically within an organization“ (Venable et al. 2016, p. 81). Moreover, while multiple episodes of formative, naturalistic evaluation are suggested to support the design process, the human risk & effectiveness strategy also involves summative naturalistic evaluation episodes. These naturalistic summative evaluation episodes are intended to assess whether „... outcomes match expectations ...“ (Venable et al. 2016, p. 80) with real people, real systems, and real settings (Sun and Kantor 2006).

Following these recommendations, we conducted multiple episodes of formative evaluation in the first four iterations. The artifact of the first two iterations was a conceptual model and therefore the use in a real setting was not possible. This changed in iterations three (demonstrator) and four (first fully functional version) that took place in the same training generation. However, being able to use functions of the first fully functional prototype (Instantiation V2, cf. table 11) in a simulation with key stakeholders, lead us to initiate additional iterations of the DSRM to embed further *objectives of the solution* into the design. Consequently, we utilized in-depth interviews in order to *evaluate* each demonstration of the artifact. Finally, in iteration five a summative naturalistic evaluation approach is chosen with real users, a real problem and a real system. The evaluation is naturalistic because diverse stakeholders (coordinator, trainers, supervisor, mentors, and participants) in a complex and global corporate setting participate at the evaluation.

A mixed methodology is used for the data acquisition in the naturalistic evaluation (Greene et al. 1989), as shown in figure 19. This involves participant observation, interviews, and data on the use of the transfer-supporting IT components. For participant observation, a researcher is present in each face-to-face training course. The approach allows the researcher to clarify what is happening in the field, to get involved in informal discussions with users, and to record informal notes of ongoing activities of the field setting (Kaplan and Maxwell 2005). This allows the acquisition of detailed information about the activities of participants, training professionals and other stakeholders of the courses, as well as on the users’ explanations and perspectives, both directly associated with the use of the components. Moreover, this participant observation also yields valuable insights for improving the usability of the transfer-supporting IT components.

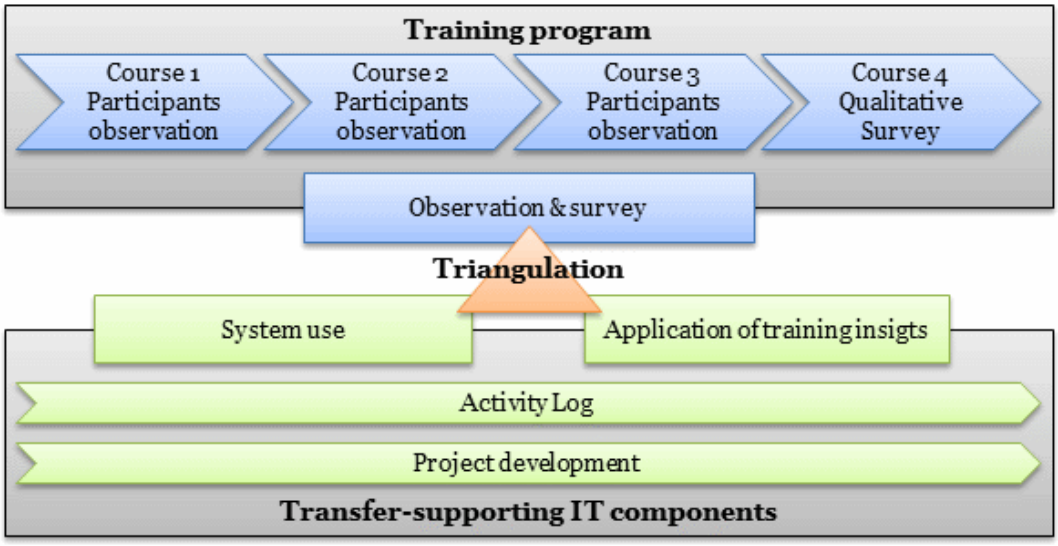

Figure 19: Evaluation data acquisition triangulation

In addition, we conducted semi-structured qualitative interviews with participants and stakeholders at the end of the training program (cf. figure 19). Each interview lasted about one hour and was audio recorded for later analysis. In total, we had the permission to interview all participants (seven), all supervisors (two), the coordinator, no mentor, and no trainer. We had no permission to interview the mentors because they did not participate at the final course the interviews were conducted and their high workload has not allowed an interview by telephone. The trainers were not interviewed because during face-to-face courses they were focused on the training as well as supporting the participants. Moreover, no trainer was interested in an interview by telephone. The semi-structured qualitative interview aims at determining user acceptance as well as the effectiveness and usability of the components, thus the interview comprises three parts. First, users are asked which components and associated intervention phase they are satisfied with and which ones they are not. Respondents are asked without any additional questions, allowing a freely share of their experiences. Next the proposed use as well as effect of the components in each intervention phase is described by the interviewer and discussed with the user. As a result, user evaluations of not consciously perceived functionalities and effects are revealed. Finally, questions about the service quality of the training and demographic questions to determine the diversity of interviewees are asked. The interviews are transcribed, coded, interpreted and associated with the IT components by us (Myers and Newman 2007). Finally, we collect system use data. To this end, a dedicated activity log function is implemented (cf. figure 19), which persists the IP

address, type of browser, time, user id, and activity type, such as login, logout, open, create, add, update, or delete activity with each function of the components. For example, a participant logs into the components and adds a KPI or comment. Furthermore, the contents of the projects are analyzed to determine the extent of transferred training insights (cf. figure 5). We triangulated the results of the interviews (qualitative data), the data on system use and quantity of applied training insights in the project (quantitative data) in order to increase the robustness of the evaluation results (Myers 2013). For this end, we compared each interpretation of a user interview with the data from system use of this user. The amount of successfully applied training insights in his project is compared with the before mentioned data, if the interpretation relates to the project. The evaluation process provides a comprehensive insight into the user acceptance, and effectiveness as well as usability of the components.

12.7.2 Evaluation results

Participants of the training program used the components proposed in this paper to design and receive authorization for seven improvement projects. Data on system use documents that participants and stakeholders involved in the corporate training service used the components during the training program, both during the training sessions as well as in their work context. Thus, the components facilitated an *opportunity to perform* by guiding participants to specific improvement projects and involving the participants' managers to create a mandate for these projects. Moreover, the components help to elicit and communicate the involvement and feedback of the managers, thus ensuring comprehensive *supervisor support*. Likewise, the components stimulated and enabled feedback on the projects by the peer group of the participants (*peer support*). In addition, the components guided the participants throughout the improvement projects to practice their learnings (*practice and feedback*). The evaluation thus demonstrates that the components effectively addressed three of the four factors of the transfer-of-training determinant *work environment* and the adapted factor of the transfer-of-training determinant *intervention design*. The impact on *transfer climate* can only be shown conceptually as we expect the reporting of measureable improvements in work practice as a consequence of the corporate training to have a positive effect. This, however, could not be observed during the evaluation.

The interviews revealed that the naturalistic evaluation had a broad diversity between individual interviewees (cf. table 14).

Age	Between 28 and 54 years
Origin	USA, France, Canada, Germany, India, South Africa
Place of work	USA, European Countries, Middle East Countries
Gender	1 female and 9 males
Experience in service management	At least 6 years
Current work area	All service management
Educational level	4 bachelor's degree, 3 master's degree, 2 apprenticeship, 1 doctoral degree

Table 14: Demographic characteristics of interviewees

In addition to the specific interviews on components and the associated intervention, users were asked whether they think the service quality of the training program has been influenced by the use of the IT components (cf. figure 20). Six of the ten respondents reported that the integration of components had influenced the service quality positively. Four of ten of the interviewees had the opinion that the integration of the components had no influence on the service quality of the training. One participant stated that due to additional expenditure the service quality has been adversely affected by the components. Six of the ten respondents perceive an increased training outcome as a result of using the components (cf. figure 20). Four respondents indicated that this was not the case for them. Furthermore, five of ten interviewees had the impression that the components decreased the amount of time to successfully pass the training (cf. figure 20). Five had the impression that it increased the amount of time to successfully pass the training. Finally, eight of ten respondents reported that the intervention provides the opportunity to practice learnings in a realistic scenario with a focus on departmental goals (cf. figure 20). We now provide detailed evaluation results of functions that are associated with all components.

Figure 20: Summary of qualitative interviews

The possibility to access the components from all sorts of devices and the related adjustment of the user interface was rated positively by nine of ten users. According to the interviewees, it also ensured the possibility to work on the project on the way by mobile devices. One participant did not like the components style. The participant said that the style is too monotonous. The data on system use revealed that the users accessed the components from different locations and with different devices. 74 % of the login activities persisted by the activity log were performed from a notebook or not portable personal computer, while 21 % performed the login from a smartphone and 5 % from a tablet. This was derived from the corresponding browser type of the login activity persisted by the activity log function. A special feature of the easy access to stakeholders was, according to all interviewees, that participants can contact stakeholders regarding the project. Key data on the project is always available establishing contact to supervisors or peers. Although, this was the first naturalistic evaluation of the components, we reproduced the final project documentation of the previous training generation. Thus, providing the participants with examples how their project documentation could look like. However, according to the interviews and the activity log one participant found a mentor by the easy access to stakeholders. Finally, all users were satisfied with the intervention design functions. In the following we provide detailed evaluation results for each of the four components.

Transfer Preparation (C1): This component provides participants with a transfer journal and access to training content. Both functions can be commented. The majority of interviewed users (nine of ten) were satisfied with the transfer journal and the simple usability. They claimed that they have used the transfer journal at lunchtime and in the evening during training days. Beside project ideas resulting from the training they have noted information about training content they are particularly interested in and wish to utilize in their work setting to improve daily business in short term. An analysis of the improvement projects revealed that actually five participants transferred information from the transfer journal to the project. The active use of the transfer journal during training days is proofed by the activity log function. Furthermore, the interviews reveal that all participants liked the opportunity to access training material and to ask questions regarding the content nearby the training material over the components. The activity log reveals the opposite. There were only a few comments and questions nearby the training content. Once the training content was downloaded the participants used the content within sections of the project documentation

only and asked their questions there. Finally, all interviewees were satisfied with the prior project listing because they were able to find examples that apply the training content. In addition the activity log indicates that this function was mainly used at the very first beginning of a project phase.

Improvement Project Definition (C2): This component provides participants the opportunity to create knowledge assets, key performance indicators, milestones, and link those to the project documentation where further sections can be used to document the project. The interviews revealed that six out of ten users are satisfied with the knowledge assets function. Four participants used the opportunity to refer to knowledge assets in their project. According to the interviews this occurred because references were already added to the transfer journal. According to the respondents a method catalog could possibly improve and simplify the utilization of the knowledge assets function. After accessing the respective projects, we found that only four out of seven participants referenced knowledge assets. However, an influence on the projects could be found because these four participants also used the insights of the knowledge assets in other section of the project documentation. All interviewed users had the opinion that the project documentation enabled them to develop the project because the structured project documentation facilitated entering the information. Furthermore, the representation of the different sections of the project documentation convinced the users. All projects were described within the project documentation in detail. The activity log reveals that the project documentation was developed just shortly before and after peer or supervisor support. This is an indication that participants take the feedback seriously and *supervisor as well as peer support* is encouraged by the components. The project documentation was continuously used by participants. Six of ten interviewed users had a positive attitude towards the KPI function. The main reason was that participants were able to discuss related KPIs that should be improved through the project in detail with supervisors and peers. In each project at least two key performance indicators were created by participants. Furthermore, the supervisors liked the opportunity to check those KPIs during the realization to review the progress. Three participants did not like the transparency of the KPIs. Each key performance indicator was discussed with supervisors and adjusted if necessary. The milestone function was either used to plan the training (two of seven) or to plan the project (one of seven). However, the function was assessed positively by those who used it. Projects of participants who used this function are especially rich in transferred

training insights. The quantity of successfully applied training insights in those projects was high. Finally, the interviews revealed that the versioning system helped seven of ten users to better retrieve project documentation changes and to retrieve which feedback initiated the change. The activity log and project documentation shows that five of seven participants used the opportunity to create versions of project documentation mainly following a peer or supervisor review.

Supervisor Feedback and Support (C3): This component provides the opportunity for supervisors to review and approve a project documentation of a project phase. In contrast, all other users of the training can review but cannot approve. Furthermore, this component allows coordinators to create regular feedback cycles by inviting users to reviews. Finally, this component provides the opportunity to all actors of the training to comment each information item within the components. According to the interviews this component is particularly useful if training participants and the person providing feedback (supervisor, mentor, or peer) are not co-located. For example a participant whose office is located in the headquarter building made the following statement: *(...) I don't really need the components to receive valuable feedback for my project, because, look, the expert in the field of the project sits in the office next door. (...)* In contrast, a participant mentioned the following: *(...) Our office in India is small and we don't have experts who could provide me with feedback to my improvement project. Over this system I can receive good feedback to my project from experts and with no additional costs. (...).* However, all interviewed users considered this function as valuable. Six of seven participants reported that they were able to improve the application of training insights in their improvement project through the reviews by supervisors as well as peers. According to four participants this happened because the supervisors had additional insights of organizational goals that could be addressed with the training content. Supervisors showed them the link between the goals and the specific training content. Furthermore, five participants mentioned that they felt more motivated in applying training insights because the risk to apply a training insight was shared over additional shoulders. Remarkably, the interviews revealed that participants liked the creation of reviews for a peer whereas they did not like the opportunity to receive peer reviews. They mentioned that they liked to provide reviews because they allow them to applicate training insights in a further improvement project and provide them with insights about the other entity. In contrast two participants claimed that they had concerned everything regarding their project and that they knew better

than all others about the essence of the project. However, by getting reviews the participants received authorization enriched with valuable information regarding their project and the application of training content. This could be further underlined by the analyzation of the project documentations and corresponding reviews. In the majority of cases the revealed application of training content in reviews was adopted in the project documentation of the participants. Nine out of ten interviewed users see an added value through the opportunity to submit fine-grained feedback. One participant perceived the granularity as too fine. He would have liked to have the opportunity to receive more general feedback. However, it was a general consensus revealed by the interviews that this function enabled the users to pay particularly close attention to the application of training content. According to the activity log this function was actively used by supervisors, trainers, mentors as well as participants. According to the interviews the regular feedback cycles encouraged all participants to work on the project constantly and provide feedback. This has been positively assessed by all interviewed users because it was a reason to interrupt daily business and to work on the project. As mentioned above changes in training content by participants were performed especially before and after the review.

Improvement Project Finalization (C4): This component provides all actors the opportunity to track measureable improvements of a project and participants can report the status of a project on planned timeslots. The detailed evaluation results of additional functions that are related to this component are provided in C2. Tracking of measureable improvements of improvement project function has been positively assessed in the interviews, especially by the supervisor and coordinators of the training. Consequently, the reasons were that the return on investment (customer) or the return on training (provider) can be tracked and evaluated. Unfortunately, we could not proof this by the activity log function because an open activity of the KPI function does not imply the tracking of these. The provider of the training service highlighted that it would be even more desirable if a project gallery had been implemented that represented the projects with the highest return on investment. This could motivate participants to reach even better results. According to the interviews seven of ten interviewed users were satisfied with the regular traffic-light-reports. Due to the continuous writing of reports, the participants need to continuously reflect on their actions and the applied training contents. Errors can be prevented or be adjusted by stakeholders. One participant state: *(...) This is too much controlling and transparent at this point. If my supervisor needs further*

insights I will report. (...) However, the participant declared that successes or failures are communicated only to chosen stakeholders. Likewise, future versions of the components could provide the opportunity to set the visibility of items to selected users.

12.8 Conclusion and Limitations

The overall contribution of this design science research project is to design transfer-supporting IT components that improve the transfer-of-training output of corporate training services. The design and summative evaluation of IT components for facilitating transfer-of-training has not yet been addressed in research. Our previous work in this area covered the initial design and formative evaluation. In this paper we present a revised and extended design of the transfer-supporting IT components. In addition to the *work environment* determinant, this revised design addresses the *intervention design* determinant. We also extended the design for improved support for the co-creation of value by fostering the interaction between training participants, stakeholders, and training professionals, e.g. through fine-grained notifications. Finally, we report for the first time on a naturalistic, summative evaluation of the transfer-supporting IT components in use with real people in a real setting in a global enterprise.

The design of the transfer-supporting IT components integrates theory-driven design based on identified determinants of transfer-of-training as well as the design knowledge acquired in an iterative design process comprising five iterations. The resulting components thus address both theory-based and practical objectives. The components support and guide participants seamlessly from the initial learning of training content to the application of the training content at work.

The naturalistic evaluation covering the extended use of the components by training participants, training professionals and other stakeholders shows that the transfer-supporting IT components and a complementary IT-based intervention are effective for embedding transfer-of-training activities into the work environment of training participants. The evaluation particularly shows the strong perceived effectiveness of the transfer preparation component (C1) and the supervisor & peer support component (C4). This indicates that participants benefit from IT support in capturing and carrying forward work-related learnings from the training program as well as from the simple integration of feedback of management stakeholders, training professionals, and peers without time and space limitations. The

evaluation of the project definition component (C2) and the improvement project finalization component (C4) are a little less positive. While a majority of users perceives the components as effective, there are also neutral or negative assessments. This indicates in our view that the transfer-supporting IT components are generally effective but require further refinement to focus guidance in and monitoring of the participants' projects.

The evaluation of the components as well as the predominately positive perceived effect on service quality and training output lends support to the theory-based design of the components, leveraging *work environment* and *intervention design* as known determinants of transfer-of-training. The observations, interviews, and the analysis of usage data acquired in the summative evaluation indicate that participants receive support by supervisors and peers for applying learnings in their work environment and perceive an opportunity to perform. The components support participants in shaping improvement projects that reflect learnings from the training as well as corporate goals. The number of successfully completed improvement projects and transferred insights indicate the effectiveness of the components, as does. This effectiveness of the components is generally supported by participant interviews, usage data, and the continued use of the components by the field partners.

The results so far provide reusable design knowledge for addressing the transfer-of-training problem of corporate training services. To the best of our knowledge, this research is the first to propose and evaluate transfer-supporting IT components and thus to provide evidence-supported design knowledge for this highly relevant area for information systems. Moreover, the iterative design process illustrates how theory-based design blends with feedback from professionals and users to yield a robust design science research output.

There are some limitations of the research. The derived components aim to leverage the *work environment* and *intervention design* determinant but the *learner characteristics* can also affect the transfer-of-training output. While the field setting did not allow for addressing the learner characteristics, this determinant is a relevant focus for future research. This research could extend the components to allow for the individualization of transfer-of-training activities based on learner characteristics. Also, there are alternative (non-IT) interventions that can improve transfer-of-training output, such as coaching. While other research indicates that information systems can be an effective conduit for learning and change programs (Markus 2004) a comparative study that evaluates the performance transfer supporting IT-

components viz. an non-IT alternative would yield deeper insights into the relative performance of the components. Finally, the transfer-supporting IT-components were solely evaluated in a long term corporate training service with a duration of one year. Furthermore, the training was exclusively for employees of one company. While we assume that the components are also effective in other settings of corporate training services, a specific evaluation more short term trainings would provide data to assess this assumption.

The transfer-supporting IT components are highly relevant to practice. The growing need for efficient corporate training services is demonstrated by increasing and substantial market volume. Effectiveness of these services, however, is limited by a failure to apply learnings at work. Improving transfer-of-training by leveraging the possibilities of information systems thus promises a valuable research output for this domain. Once used, the IT components can not only improve transfer-of-training within a single setting but also provide more transparency of transfer effects across multiple trainings. This transparency allows corporate training service providers to improve their trainings and to demonstrate the value co-created with customers of these services (return on training). In addition, the operational support of improvement project realizations could be potentially a new service for corporate training providers. The training providers get deeper customer insights, allowing them to better contribute to transfer-of-training. Finally, as the components could potentially facilitate knowledge transfer as users of the system can search for project knowledge and experts.

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Appendix: Final Declaration

Hiermit erkläre ich,

Sharif Amrou, geboren am 08. November 1982 in Gütersloh,

an Eides statt, dass ich die vorliegende Dissertationsschrift

„Improving Service Productivity with Transfer-Supporting IT Components: Design and Evaluation of IT Support for Corporate Training Services“

selbst verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

I hereby declare, on oath, that I have written the present dissertation by my own and have not used other than the acknowledged resources and aids.

Hamburg, den _____ _____

Unterschrift