E-Learning Success in Action!
From Case Study Research to the creation of the Cybernetic e-Learning Management Model

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Abstract: **This paper reports the use of e-Learning in practice based on a structured and embedded** *participatory observation* **and the tracking of activities by conducting a case study including two cases in an international environment of BMW Group as an international acting organization. The observations aimed at two different research goals; first, to identify real existing problems and therefore the** *need-for-action* **when using e-Learning in professional organizational context; secondly, to observe and analyse structures supporting successful e-Learning based on the conclusions and research hypotheses produced in previous literature review [3]. Key insights of the conducted case study on the success and problems of e-Learning in empirical context are; (1) all e-Learning success dimensions were assumed [3] can be observed within the two empirical cases at BMW Group; and (2) correlations between the e-Learning success dimensions (especially e-Learning critical success factors and e-Learning key performance indicators) were tested and found. The second part of this paper consists of the description of the** *Cybernetic e-Learning Management Model* **which is derived from the insights are gained by the previous mentioned case study.**

Keywords: **e-Learning success management, case study research, BMW Group, Cybernetic e-Learning Management Model**

I. Introduction

e-Learning seems to be an adequate answer to the need for training and education in increasing globalized working environment [15]. Derived from previous literature review in the field of e-Learning success management and evaluation [3], this documents shows the results and insights of research in this field by doing a case study at BMW Group. Conducting research in the field of e-Learning effectiveness and efficacy makes, from the authors point of view only sense when combining it with real existing, empirical context. For this a case study was designed and conducted by using two different cases within the international activities of BMW Group. Goals for this are, (a) the long-term gathering of data for analysis of success and problem issues of e- Learning in professional organizational context and (b) testing the research hypotheses described by Hilgarth [3] on e-Learning success management and evaluation.

#	Hypothesis
H1	e-Learning success is located in different dimensions and is represented by different indicators that are equal independent on the scientific discipline.
H2	e-Learning success occurs at different Levels;
H3	e-Learning is a multi-facet issue that needs (*systemic*) treatment from multiple success domains *technology, pedagogic, organization, quality, economics* and *ethics*.
H4	e-Learning success (performance) is manageable by a core set of influencing e-Learning Critical Success Factors (eL-CSF), and e-Learning Key Performance Indicators (eL-KPI) are located in the different success dimensions.
H5	The different, often in the wording varying criteria and factors can be aligned over the different scientific disciplines.
H6	Success criteria and factors consists of a hierarchical structure and weighting. This means that not all mentioned factors/criteria do have the same degree of influence and importance to the success of eLearning.
H7	Not all the mentioned eL-CSF and eL-KPI are adequate or useful for all existing cases of eLearning. The use of it has to be customized for a specific situation.
H8	Correlation between the factors, indicators and other success dimensions exist.
H9	The permanent management and evaluation of it (eL-CSF & eL-KPI) becomes necessary.
H10	Management and Evaluation presumes a holistic model comprising the described success dimensions, actors, factors, and indicators for e-Learning.
H11	The holistic model might show applicability in average situations.
H12	Not all indicators can be measured, intangible indicators plays a role for obtaining success.

Table 1. Research Hypotheses - guideline for research on e-Learning success management and evaluation [3]

Respecting the insights coming from the case study the article introduces in the theory of the *Cybernetic e-Learning Management Model.* This model shows the consequent step for the insights are gained in the case study research.
The paper is structured after the applied research, the illustration of the case study results, the illustration of the derived and created *Cybernetic e-Learning Management Model* theory as well as the conclusion and discussion of the further research.

II. Action Design Research Method

The underlying research method does follow different research strategies derived from the questions are addressed to it. For this the overall research strategy follows the steps of *Action Design Research* as described by Rossi *et al* [5] and shown in Figure 1.
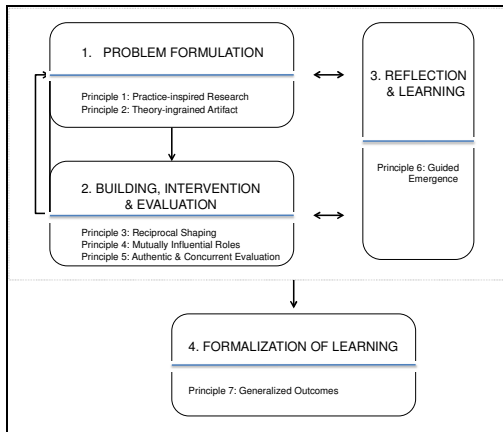
Figure 1. Life Cycle of Action Design Research [5]

This approach offers the opportunity for the investigation of real existing situation, the creation of a theory addressing a general class of problem identified as well it offers space for the test of the theory in similar problem context. E-Learning is a subject, which shows an embedded concept of social life due to its application in international acting organizations. *ADR* does meet the main criteria of researching social life context [6] and therefore it matches perfect for reaching overall research goals.

A. Research Process

Table 2 shows explicitly the steps, goals and activities characterize the research process respectively for the case study and theory-creation described within this article. Reflecting the in Figure 1 shown steps of the ADR approach this address the steps *(1) problem formulation, (2) building, intervention & evaluation* as well as *(3) reflection and learning*. Additionally to this article several publications were completing this overall research life cycle (see [7], [8]).

Step	Design Case Study	Setup of Case Study	Data Gathering	Data consolidation	In-depth analysis of data	Interpretation & deriving of theory
Goal	Design of valid and reliable case study research	Safe and feasable field of investigation in empirical, organizational setup is defined.	All possible data can be achieved within the cases are gathered and centrally stored in database.	Gathered data are consolidated in a way they can be analyzed and interpreted under the aspects of reliablity and validity.	Consolidated data are analyzed in direction of research hypotheses by using central research questions.	Documented insights and research hypotheses for future research.
Activities	Defintion of research question Check of different research strategies and techniques Decision of case study and instruments	Definition of cases with partners in organization Clearification of feasibility of case study research with management	- participatory observation - interviews - field notes - pilot study - acquiring documents - recording own actions - aquiring software products	- Development of database - Structuring of raw data - Deriving of case events - Reading and commenting data - Mapping of data to events - Verification with experts	- qualitative interpretation - correlation measurement - reliability check - documentation	- Interpretation of results - Alignment with hypotheses - Creation of "Cybernetic e-Learning Management Model" Theory
Results/ Outcome	**Decision for case study design with a minimum of two cases using the instruments of *participatory observation, interviewing* and doing *field notes.***	**Case Study was approved by BMW Group management. Two Cases: - ETK Blended Learning (2004-2009) - IPAC-Q Training (2007-2009)**	1.2 GB file space - **2** e-Learning programs - **178** project meetings - **14** expert interviews - **560** eMails - **581** documents - **14** training reports	**40 chronological sorted case events in research database**	**1 analysis report including all calculations as well as reports in SPSS software**	**Research implications & Cybernetic e-Learning Management Model**
Time	2003	2003/2006	2004-2009	2009	2009-2010	2010-2011

Table 2. Research Process – goals, activities and results

B. Case Study Design, Data Gathering and Analysis

Case study research in manner of qualitative research is the dominating method of this research. Reaching the goal of valid and reliable results, *data* and *methodology triangulation* [4] was used. This means the use of different data sources (two in

length and situation varying cases) as well as mixed methods/techniques (participatory observation, interviews, statistical analysis, taking field notes etc.) for investigation of intended research question.

1) Case Study Design

The author started in 2003 with the case study by guiding and observing e-Learning projects in international business context. The all-over goal of the case study is the gathering of sufficient data for the investigation of e-Learning maturity and success management and evaluation. For this the case study was designed with *multiple cases*, which were started at different times with different target groups, different instructional designs but with common business goals and context. The first relevant e-Learning case, the *ETK Blended Learning* program, was started in 2003 and observed till spring 2009. Within this time the second case, the *IPAC-Qualification (IPAC-Q)* program found its setup in 2006 and under observation till the end of 2009. Both programs are embedded into the training and e-Learning environment of BMW Group Aftersales. This professional environment covers beside a general *D&T framework* (in sense of development and training curriculum) also the introduction of a learning management system (LMS) *TRIAS* (Training In AfterSales). Both e-Learning programs were started with the intention to support international roll-out of Information System software in estimated 3.300 BMW Group licensed retail shops worldwide with training of functional/technical as well as soft skills. In practice, international rollout means heterogeneous environment in sense of language, culture, user experience and educational background in common as well as specific technical domain. These two cases offers a wide field to a range of aspects are relevant for designing, implementing, operating and evaluating (including teaching and learning processes) e-Learning in organizational context as well as considering its value-add (or effectiveness and efficacy) for the stakeholders. In sense of *data triangulation* both cases contributes to the initial research goal of investigation of e-Learning success in empirical, organizational context.

2) Data Gathering

Through accompanying the cases and journalizing all relevant observations (interviews etc.), case data were gathered in a structured process. Main instruments (resp. techniques) for this data gathering process were *participatory observation* [1] with making of *field notes* or *recording own actions* for occurrences (178 project meetings, 560 email conversations, 14 trainings instructions) in project work as well as usage of training material in live situation and *piloting* (1 pilot of IPAC-Q) as well as planning and conducting of *subject matter expert interviews* (14 interviews with domain specialists, instructors, learners, business management). In addition to these all relevant *documents* and *software products* were acquired. All data gathered were classified and stored within a central database.

The author acted as project manager, project member, business stakeholder or mere embedded observer. With the opportunity for the author guiding the projects and training processes in both cases as *embedded observer,* the gathering of data over nearly six years has to be seen as optimal because of reaching a broad database. An existing difference in the setup

(e.g. goal-setting, readiness of environment/infrastructure and mind-set for e-Learning in target group etc.) of the two cases is seen as realistic but challenging for data consolidation over the whole case study. But having these differences in the case setups offered also the opportunity for gathering information over different aspects are real existent. Also the mentioned research design and position of the author allowed a more "*natural*" observation than explicitly conducting of *quasi-experimental* research. All the gathered data were chronologically structured and stored after *case events*. These *case events* shows exposed situations at an explicit point of time and subsumes all data are clearly adjunct to it. Exposed describes difficult situations in the projects, exceptions to the planned and expected attitudes, progress in project as well as expected results, and use of the e-Learning programs as well as milestones were typically occur. All data were digitalized (e.g. from notes on discussions till log files and Microsoft Office® documents) and administered in a database for analysis. Finally the raw data sourced an amount of 1.2GB file space. Through the structuring of the data by the *case event classification*, 40 samples (29 in ETK Blended Learning, 11 in IPAC-Q) exist for further analysis.

3) Analysis

For further analysis the 40 relevant case events were used. After mapping the research hypotheses with the research questions (see *Table 3*) a data record sheet for entering the case events and aligning it with the research questions and hypotheses was created in the database. **Figure 2** shows an example for recording each use case event.

Figure 2. Data record sheet "case event"

Research instrument is adopted from previous research (literature review) by integration of all found e-Learning success dimensions and its values. Next each case event was checked for its contribution to each of the six research questions (see Ch. III). Finally this allows the analysis over all events in each specific case as well as over all cases and makes the results comparable and internal as well as external *valid*. For analysis of data several statistical methods (*reliability analysis, correlation measurement, frequency, main*) by using of SPSS software were applied. Altogether this data analysis was used for interpreting the results in qualitative way and using as much as possible via "quantification of use case observations". Results of this *case event analysis* are described in Ch. III, section A.

C. Theory Creation

Theory-creation is the specific methodological instrument used especially after doing the case study. Following Gilberts [6] philosophy for explanation here, theory was created in an *induction* kind. This means that the insights coming from the long-termed *embedded observation* within the case study at BMW Group serves as basis for the creation of the general theory named *Cybernetic e-Learning Management Model*. The creation of the theory in the, by Rossi [5] described *Action Design Research* overall approach serves for the *evaluation and identification of the general class* of the issue of e-Learning management was observed for e-Learning by using it in the international acting organization. The theory of the *Cybernetic e-Learning Management Model* is described in Ch. III, section B. The test of the model is planned for further case study research at a similar organizational situation.

III. Case Study Results and Theory creation

A. Case Study Results

The research is driven by the question after *how strongly does the situation marked in the literature from successful e-Learning with the reality to observable cases coincide?* Next a set of seven sub-questions was defined for operational and detailed investigation. *Table 3* shows the mapping of the research hypothesis to the tangible sub-question.

#	Hypothesis	Mapping	Research Sub-Questions	#
H1	e-Learning success is located in different dimensions and is represented by different indicators that are equal independent on the scientific discipline.		What is the observable success (as well as are the observable problems/issues) seen in planning, designing, implementing, usage as well as evaluating eLearning the investigated cases?	Q1
H2	e-Learning success occurs at different Levels;			
H3	e-Learning is a multi-facet issue that needs (*systemic*) treatment from multiple success domains *technology, pedagogic, organization, quality, economics* and *ethics*.		Does the case study provide evidence of the existence of success in multiple alternative (and co-existing?) dimensions phases, processes, domains, concernment levels, eLearning Critical Success Factors (eL-CSF) as well as eLearning Key Performance Indicators (eL-KPI)?	Q2
H4	e-Learning success (performance) is manageable by a core set of influencing e-Learning Critical Success Factors (eL-CSF), and e-Learning Key Performance Indicators (eL-KPI) are located in the different success dimensions.			
H5	The different, often in the wording varying criteria and factors can be aligned over the different scientific disciplines.		If eL-CSF can be observed, what factors are mainly observed in the cases?	Q3
H6	Success criteria and factors consists of a hierarchical structure and weighting. This means that not all mentioned factors/criteria do have the same degree of influence and importance to the success of eLearning.			
H7	Not all the mentioned eL-CSF and eL-KPI are adequate or useful for all existing cases of eLearning. The use of it has to be customized for a specific situation.		If eL-KPI can be observed, what indicators are mainly observed in the cases?	Q4
H8	Correlation between the factors, indicators and other success dimensions exist.			
H9	The permanent management and evaluation of it (eL-CSF & eL-KPI) becomes necessary.		If evidence for eL-CSF and eL-KPI is observed in the two cases, what degree of correlation can be observed between eL-CSF and eL-KPI?	Q5
H10	Management and Evaluation presumes a holistic model comprising the described success dimensions, actors, factors, and indicators for e-Learning.			
H11	The holistic model might show applicability in average situations.		Does the need for an all-over, holistic framework respecting all these dimensions for the management and evaluation of successful eLearning in practice exist and does it seem to be applicable in the context of the cases in hand?	Q6
H12	Not all indicators can be measured, intangible indicators plays a role for obtaining success.			

Table 3. Mapping of research hypothesis with research questions for case study

With exception of hypothesis five (H5), all hypotheses are addressed within this case study analysis. Hypothesis five can not be investigated in this case study set-up; the effects of standardization for wording over the different scientific disciplines might be addressed in another research step afterwards a first attempt was done. In the following sections

each research question and its accompanying results are illustrated. The purpose of this chapter is the report of results and its discussion. This section reflects therefore on the quantitative analysis of structured case study data (so far it isn't restricted through the use of qualitative research method) and the qualitatively interpretation of results for answering the defined research questions. Each research question is represented in a sub-section.

1) **Question 1**: *Observed success, problems and issues of e-Learning in empirical context*

This section addresses the issues of the underlying research question one (Q1). Therefore it concerns on the observable success, failure and problem issues in the underlying cases. Analysing the two independent cases following conclusions were phrased:

- **An enhancement of the, in literature mentioned success is necessary**

With the previous review of theory and literature [3] concerning this context of successful e-Learning 48 (not distinct) descriptions for success were identified. With analysing the above described cases, additional five such success objects for e-Learning were identified. These are (1) *adequate and feasible e-Learning strategy based on transparency in organizational context*; (2) *availability of training material is widely communicated*; (3) *awareness of content and availability of training material*; (4) *up-to-datedness of e-Learning content*; and (5) *common mind-set and understanding of e-Learning goals*.

- **Not all success mentioned in investigated literature has been shown in the cases**

27 out of *48* former identified success descriptions were not observed within the case study. Reasons are (1) that some of the success described in literature are simply not relevant or do not represent the real existing understanding; (2) the in literature described success is also adequate for empirical context but not for the investigated case setup; and (3) the 48 former identified success descriptions are unadjusted and shows redundancies in the meaning of it with different wording.

- **E-Learning success do not exclusively interrelate to one e-Learning phase or process**

With the analysis it became obvious that the success objects of e-Learning don't exclusively interrelate (in sense of the MECE principle) to one specific e-Learning phase or process. Therefore e-Learning seems to be treated at multi points of time in its lifecycle for becoming successful.

- **Success occurs on different granularity and hierarchical placements (H2)**

The analysis of the *40* case events shows fully evidence for the hypothesis that e-Learning success occurs with different granularity and in different hierarchical placements. In 40 out of 40 events the objects are obviously in hierarchical structure and on different granularity level. Condensing the results of the observation of the cases the success of e-Learning obviously can be categorized into *organizational success*, *pedagogical success*, *cultural success* and *technological success*. The overall structuring element (top of hierarchy) for the success of e-Learning is from the author's point of view the *effectiveness* and *quality*. The observations were made in both

cases within the case study with an almost similar setup. On this *synchronic reliability* [4] the evidence can be considered as general applicable.

- **Successful e-Learning is a management issue (H9)**

With this research also clear evidence for previous formulated hypothesis 9 is given. All success descriptions were observed within the 40 case events can be influenced by singular or permanent treatment over the e-Learning lifecycle. Therefore e-Learning success is not a mere *"product"* of technical solutions or quality of contents and its production. It is an issue for management and evaluation.

2) **Question 2**: *Existence of e-Learning phases, processes, domains, concernment levels, eL-KPI's and eL-CSF*

In the centre of this section stands the description of the results were achieved through investigation of sub-question two (Q2). Investigation of this question addresses beside hypothesis one (H1) also hypothesis two (H2). Following key insights were derived from case study analysis:

- **E-Learning and its typical lifecycle in sense of phases and processes**

Reviewing each case event, comparing both cases results and analysing the all-over case study results shows clear evidence for H1 (mean of *.0974* with *"yes, the hypothesis 1 will be fulfilled with case event observation"*). Looking at the frequency of the variable *e-Learning phases* this means 65% of the case events were dedicated to the *pre-usage*, 25% to *usage* and 10% to the *post-usage* e-Learning phases. Main processes were observed are in following sequence: (1) *analysis and determination of general framework; (2) conducting project management and controlling*; (3) *e-Learning initialization and strategy*; (4) *e-Learning design*; (5) *e-Learning production*; (6) *e-Learning launching*; (7) *e-Learning execution*; and (8) *e-Learning evaluation*. The processes *e-Learning content translation, predefine content with subject matter experts* and *conducting project management and controlling* were, especially important for international acting organizations, additionally observed to identified processes in literature.

- **Correlation between e-Learning phases and processes**

Considering the relationship between the observed e-Learning *phases* and *processes*, a correlation between both variables obviously exists. Analysing this obvious relationship using the *Pearson-correlation* method results in a significant value of *.618*. Therefore evidence for hypothesis H8 is given.

- **E-Learning success domains – a multi-facet issue**

Next the existence of the, in the literature review emerged dimension of e-Learning success domains were proofed concerning its existence in the investigated cases. The analysis shows the existence of following domains in the cases:

E-Learning success domain
Institutional
Technological
Pedagogical
Socio-Ethical

Table 4. Observed e-Learning success domains

Not in both cases always all domains are observable. Therefore the variable *domain* shows different parameter values, e.g. *all* when all domains observable in the considered use case event, *institutional (etc.)* when exactly the domain *institutional (etc.)* is observable or *institutional & socio-ethical (etc.)* when exactly the domain-combination of *institutional* and *socio-ethical (etc.)* are observable. Considering the frequency of observation the domains are ranked with (1) *institutional,* (2) *technological,* (3) *pedagogical* and (4) *socio-ethical.*

- **Allocation of domains to e-Learning phases**

Next interesting aspect (H8) considering the domain dimension in the investigation is how are these observed *domains* allocated to previous considered *e-Learning phases.* First there is a relation between the *phase* and *domain* dimension observably; secondly in the phase *pre-usage* the domain *institutional* is mainly observed (followed by *technological, pedagogical* and *socio-ethical*). In the phase *usage* the allocation looks like these: (1) *institutional,* (2) *pedagogical,* (3) *technological* and (4) *socio-ethical.* At least in the *post-usage* phase the allocation analysis shows that there are not all domains represented and observed (*institutional* and *technological* were observable). The question, if the main focus of e-Learning lays at the *institutional* issues can also be answered with *yes* when looking at this allocation. This insight is also interesting reply to the often-existing meaning, e-Learning is a pure technological topic with respect to pedagogical issues.

- **Concernment level – success or failure is not always a general issue**

The hypothesis two (H2) includes as another aspect that the success of e-Learning concerns to one of these levels: *individual level; collective level* or *instructional level.* The idea behind this was, when e-Learning success/failure occurs it will be on the level of all stakeholders in sum (*collective,* e.g. the whole organization is effected through not having accessing to e-Learning module), for one or some stakeholder party (*individual,* e.g. the failure/success causes in individual reasons and regards to a partly of the stakeholders) or in the relationship between instructor and learner (*instructional,* e.g. learner failure is caused in missed communication and scaffolding activities from the instructor) localized. First, the above-mentioned *concernment levels* for success or failure were observed in both cases. Secondly some of the case events had shown, that success or failure is on all levels at the same time. This leads to the conclusion that e-Learning is successful or failures not always in a comprehensive way and proves the formulated hypothesis two.

- **Success or failure of e-Learning is influenced by a core set of critical success factors**

With investigation of sub-question one (Q1), also the existence of e-Learning critical success factors was investigated. In general this question can be answered with *yes.* 97.5% of the observed case events do show one or more of the in literature identified influencing factors.

- **Key Performance Indicators for e-Learning**

Analogue to the analysis of the case events concerning the influencing factors, finding an answer to the research hypothesis 1 does also include the investigation after the existence of success indicating factors. In general this question can be answered with *yes.* 97.5% of the observed case events do show one or more of the in literature identified indicator.

3) ***Question 3: Observed e-Learning Critical Success Factors (eL-CSF) within the case study***

Having found evidence for the existence of so-called e-Learning Critical Success Factors (also eL-CSF) within the both investigated cases, this sub-chapter does handle the sub-question three (Q3) and its accompanied hypotheses H4 and H5. Therefore the aim of this chapter is the illustration of the observed factors influencing success through the observations in the cases (respecting existing literature material), the consideration of hypothesis that these eL-CSF consists of *hierarchical structures* and therefore different *success influence levels* (H4), the consideration of *adequateness* of the complete set of *eL-CSF* for all kind of case events where investigated (H5) as well as the investigation of the relation between eL-CSF and the above described *e-Learning phases and processes.*

- **Observed eL-CSF**

The cases show the existence of *eL-CSF;* these existing, success influencing factors are *"(…) ex-ante or at runtime manageable for actively influencing the success of e-Learning (…)"* [3]. With the literature review [3] set of *309* factors was identified and documented. In total 70 *eL-CSF* were observed in both cases. *Table 5* offers the top-ten most observed factors in case study.

e-Learning Critical Success Factor
Professional (Project) Management
Language differential
Cooperative/Collaborative Learning
Direct communication to and feedback from target group
Audience analysis
Involvement of powerful organizational instances into communication, definition, development and launch process
Availability of high-quality material by using ICT and distribution channels
Continuous management of content up-to-datedness as well as of communication and marketing
Content analysis
Respecting cultural diversity

Table 5. Most observed eL-CSF

With using two use cases the question after the *reliability* in the case study structure at this point might be considered as important for the *generalizability* of the results were analysed here. Using *reliability analysis* after Cronbach [2], a resulting $\alpha = .468$. Because of the restriction of investigated two cases, from the author's point of view further, long-termed investigation for stabilization of reliability of results is necessary.

- **Hierarchical eL-CSF structure - on the observed power and influence of factors**

Another related question is; does a hierarchical structure in the observed eL-CSF exist (H4)? During gathering of the data in case events with the above mentioned data collection database sheet, the author gave each observed *eL-CSF* item a hierarchical level and mapped it to the *e-Learning processes*

for later analysis of observable structures. Avoiding high complexity, a maximum of two levels were defined for this mapping during the observation. For the mapping multiple allocations to each process were allowed. Respecting this *two-dimensional-structure-observation* helps first to identify the importance (in sense of influence and power) of each item as well as to answer the question about the existence of *granularity level*. Bringing it to the point, *management of e-Learning, definition of e-Learning strategy, treating of organizational politics concerning e-Learning, the availability of necessary e-Learning competencies and resources, making marketing and communication for e-Learning in organizations, respecting administrative affairs, respecting cultural aspects, having an adequate and excellent instructional strategy, reaching a high level of qualitative standards* as well as *using adequate and efficient technology* are the top-level success factors. All other observed factors might play a subordinate role. Evidence for H4 is proven.

4) Question 4: Observed **e-Learning Key Performance Indicators** (eL-KPI) within the case study

The purpose of this sub-chapter is, based on the general observation of e-Learning Key Performance Indicators (eL-KPI) the test of hypothesis H4, H7 and H12.

- **Observed eL-KPI**

The cases show the existence of eL-KPI; these existing indicators "(…) inherent ex-post indication of the success or failure of e-Learning (…)" [3]. In sum 142 success indicators have been gathered, 133 of which from the literature and further 9 indicators were observed within this research and added to the catalogue of eL-KPIs for further data analysis.

e-Learning Key Performance Indicators
Effectiveness; the contribution of e-Learning (object/program) to the degree of goal reaching
Costs (incl. project costs)
Satisfaction (incl. e-Learning satisfaction ELS, reaction and satisfaction)
Effects on business processes
Cost-Benefit-Ratio
Efficiency; tracking economical effort regarding the e-Learning program
Material stimulate lively and interactive learning processes
Project progress
Learning outcome

Table 6. Most observed eL-KPI

Similar to *eL-CSF* the question after the reliability of the case study setup regarding the *generalizability* of the analysis results might be asked here. Applying the *reliability analysis* after Cronbach [2] the $\alpha = .742$ indicates reliability for the research construct. Therefore from the author's point of view with this case study setup up are the results of analysis of *eL-KPI* in general valid. Also here further long-termed investigation (also in different contextual setting) might be conducted for manifestation of these results.

- **Intangible eL-KPI – not all success indicators are of quantitative nature**

Often the requirements in today business world are after the quantification of success in best case expressed through monetary measures. With hypothesis twelve (H12) it is assumed that not all indicators are measurable because of its nature. Looking first at the observation of *measurability* in the *40* case events *40,3%* was ranked as "*non-measurable*" (or *intangible)* and *59,7%* as "*measurable*" indicators. Considering the measurability at the level of the indicators, and therefore at the 47 distinct observed *eL-KPI*'s, *15 (31,9%)* indicators are as "*non-measurable", 32 (68,1%)* indicators are as "*measurable*" identified. The shifting of the ratio comes from the fact, that some of the *eL-KPI* were partly identified as non-measurable at the level of use case events but do not show this attribute by consolidating observations on the level of each indicator. Typical intangible indicators are the *effects on business processes* or *material stimulate lively and interactive learning processes.* This observation provides evidence for H12.

- **Usefulness of eL-KPI**

Considering the list of *142 eL-KPI* and reviewing it after the question of usefulness for possible empirical e-Learning cases, the two cases support fully the hypothesis that not all *eL-KPI* are useful. However, this hypothesis cannot be validated based on only two cases in this underlying case study. Under the line no general evidence for H7 is shown by the case study setup.

5) Question 5: Observed **correlation** between eL-CSF und eL-KPI

Not only from the point of view of the argumentation in the last sub-chapter, the question regarding the dependency of the elements eL-CSF and eL-KPI through the analysis of the case events has to be seen as interesting. This chapter aims at hypothesis H8 and will test in two different ways: (1) the analysis of the general degree of correlation between the two elements as well as (2) the consideration of the *pair wise* correlation of the observed *eL-CSF* with the observed *eL-KPI*.

- **General correlation**

This trivial correlation calculation shows significant general evidence for the existence of correlation between observed eL-CSF and eL-KPI (H8) over all case events with Pearson Correlation value of *.746*.

- **Pairwise correlation**

Out of the *3.290* total pairs a set of *186 (5,65%)* show correlation (*Pearson > .410*) with high significance (significant at the <0.01 level – 2-tailed) and *101 (3,00%)* show correlation between *.320* and *.409 Pearson correlation* factor (*Pearson*; significant at the 0.05 level - 2-tailed). This calculation shows a more focused correlation of eL-CSF and eL-KPI. A set of 20 pairs shows full correlation *(Pearson = 1).* Also with this investigation the hypothesis H8 is proven and the basis for further interpretation is given.

6) Question 6: Conclusion for a holistic e-Learning maturity and success **management framework** coming from case study

Within this last sub-chapter the all-over question after the need for a holistic, all above considered elements including e-Learning management and evaluation framework (H11) will be discussed based on the observation and experience of the embedded observer through uses cases are in the centre of

interest. In 97,5% of case events the need for creating and validating a framework or theory that concerns on the success of e-Learning was observed.

B. Cybernetic e-Learning Management Model

The *Cybernetic e-Learning Management Model* does provide a theoretical framework which aims on transparency of typically *e-Learning phases & processes*, *domains*, *success paths* as well as the needed management *methods* and *instruments* for e-Learning in international acting organizations. In the following all these mentioned *elements* of the theory are described.

1) General Characteristics, Terms & Model Overview

The *Cybernetic e-Learning Management Model* shows the general characteristic of a management approach that follows the basic understanding of *systemic-evolutionary* management of complex situations for e-Learning in international acting organizations [13]. E-Learning in international acting organizations shows complexity and needs the management amongst the lack of all information are needed for management without uncertainty. The philosophical goal of e-Learning as part of an organizational system is to support the *economic viability* of the organization. Therefore e-Learning is part of the viable system, which follows *rules*. The *Cybernetic e-Learning Management Model* described in this document shows these rules.

The model consists of different elements will be described in the following sections of this chapter. With the pre-posited literature review and case study research a comprehensive view on existing theories as well as on the need for such a model were analysed, identified and committed by different subject matter experts as well as in the scientific community by accepting submitted papers on this research and its outcome. The model is directed by the typical steps, phases and activities (processes) were found in literature [9] as well as were observed in the above described case study research at the international acting organization BMW Group. Khan [12] provides with his *e-Learning framework* an impressive theoretical work in that context. A first main difference of the model described within this paper compared to Khan's model is, that he sees the management of e-Learning focused on the "*maintenance of learning environment and distribution of information*" [12].

With the here described model the *management* activities will be handled as the central concept for a multi-facet and continuously treatment e-Learning in international acting organizations in sense of *sine qua non*. The dimensions are illustrated by Khan's work will be fully respected within the model is described here. The *Cybernetic e-Learning Management Model* might be understood as an extension and evolution of this previous work and not as a substitution of it. e-Learning in international acting organizations is a multi-facet topic which has to be handled in times of first implementation but also in sense of life-cycle in a continuously manner. e-Learning (and its substituting terms) in the context of the here described model subsumes it as a *technological software solution,* a *pedagogical-didactical concept,* an *instrument for knowledge management*, a specific *e-Learning program* and/or as an *Information System solution* like *a Learning Management System.* **Figure 3** gives an overview

for the elements of the *Cybernetic e-Learning Management Model* on a high level.
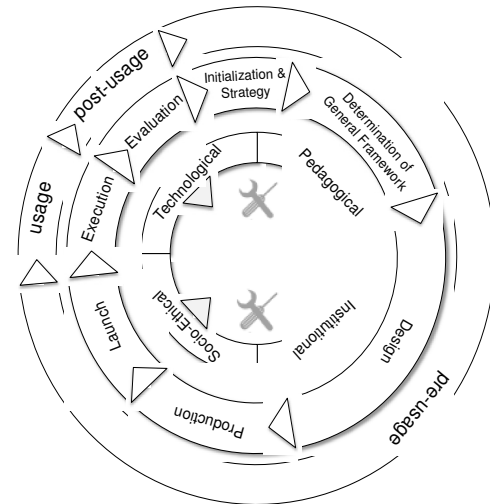
Figure 3. Elements of the *Cybernetic e-Learning Management Model*

2) Element 1: e-Learning Phases, Process Model, Roles & Responsibilities

As mentioned the model is guided in a chronological order by the use of typically *phases* and *processes* for e-Learning in organizations do act in international scope. In general the activities concerning it can be divided into three major phases; *pre-usage, usage* and *post-usage.* Activities within the *pre-usage* phase are the *initialization and strategy finding* processes; the *determination of the general framework;* the *design* of the e-Learning solution (platform, program or module); the *production* of the e-Learning content (program or module) as well as the *launch* of it within the user context (teacher and learner target group).

Next phase is the *usage* phase of the launched e-Learning program that includes the timely independent process of the e-Learning *execution.* It does concentrate nothing less than on the complex issues of teaching and learning by using the new media-driven solutions and concepts e-Learning provide. In advance it has to be said, that it is difficult to determine exact activities and order of it in highly individual teaching and learning processes. In fact it is interesting to address activities like *administration*, *conducting training sessions* and *assessment of learning transfer* by these sessions. All these activities seem equal and necessary for the execution of professional training session. The end of an e-Learning life cycle show the post-usage phase which mainly concentrates on the evaluation activities for e-Learning. **Figure 4** (a/b) provides the process model in an addition detail level and shows the hierarchical relation of it to the described main process steps.

Figure 4(a). E-Learning Process Model with detail level 1 and 2 – Part I
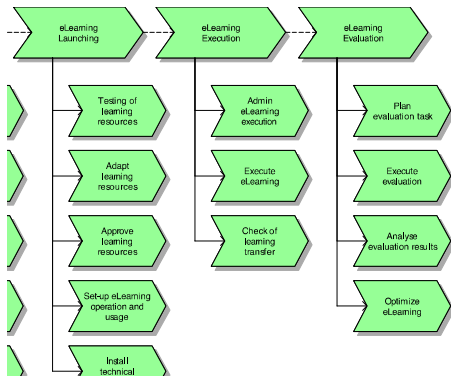

Figure 4(b). E-Learning Process Model with detail level 1 and 2 – Part II

Combined are *roles* and *responsibilities* do come along with the *phases & processes.* The case study research as well as the previous literature review shows the following roles are accomplished with the above-shown processes:

- **Owner**; business owner who is interest in solving operational problems by using e-Learning in the organization.
- **Sponsor**; business management which supports the project in the management of the organization.
- **Analyst**; methodologist and business context specialist who analyses the existing situation and maps it to exact e-Learning scenarios.
- **Subject Matter Expert**; knows the context and content which is object for the e-Learning problem.

- **Designer**; translate the e-Learning scenarios and subject matter to a technical, media-driven and learn-pedagogical solution. Is responsible for the functional specifications for the later e-Learning program.
- **Author**; translates and describes the context and content in learning modules and chapters. The result of his work is the storyboard.
- **Implementer**; programs the pedagogical-technical as well content specifications into the e-Learning solution.
- **Instructor**; administrates and teaches with e-Learning program in different pedagogical settings (e.g. scaffolding; collaborative learning, blended learning etc.)
- **Learner**; learns with e-Learning program in different pedagogical settings (e.g. collaborative learning, blended learning etc.)
- **Evaluator;** evaluates the overall correctness and effectiveness of e-Learning processes and its outcome.

These roles take different responsibilities for the processes. The responsibilities are:

1. **in authority for** *activity and its outcome* (a)
2. **conducting** *activity* (c)
3. **supporting** *activity* (s)
4. **being informed** *about progress and result* (i)

Table 7 provides a mapping of the processes (in detail level 1 as shown in **Figure 4**) to the above-described roles.

Process	Owner	Sponsor	Analyst	Subject Matter Expert	Designer	Author	Implementer	Instructor	Learner	Evaluator
eLearning Initialization and Strategy	a	s	c	s	s	s	s	s	s	s
Analyzation and determination of general framework	a	i	c	s	c	c	c	s	s	s
eLearning Design	a	i	i	s	c	c	s	s	s	s
eLearning Production	a	i	s	s	s	s	c	-	-	s
eLearning Launching	a/c	s	-	i	-	-	s	i	i	s
eLearning Execution	i	i	-	-	-	-	-	a	c	-
eLearning Evaluation	a	i	i	i	i	i	i	i	i	c

Table 7. e-Learning Process-Role-Responsibility Matrix

3) Element 2: Success Domains

Beside the typically occurring processes, which might be seen in a life-cycle manner, a main element for managing e-Learning in international acting organization is the construct of *e-Learning Success Domains.* A success domain shows a *specific sphere of knowledge* that is needed to respect for implementing and operating e-Learning in a successful manner. *Table 4* shows these success domains. In the following each domain is characterized.

The **institutional** domain does consist the issues and knowledge is relevant concerning the target institution e-Learning is intended to introduce, is introduced, is in use or has to be evaluated within. Orienting on Khan, this domain does consist of the categories *administrative affairs (e.g. financials, budgets, marketing and communication), academic affairs (e.g. development & training framework), student services* [12] as well as *management-political affairs (e.g. stakeholder & management attention and its involvement, management team, management tools, quality*

management). From the authors point of view also, the by Khan separate handled context of the *resource support issues (e.g. availability of resources)* and *evaluation* should be part of this domain because of both issues will be in the decision of the organization which uses e-Learning.

The **technological** domain subsumes the activities and knowledge regards to the *technology-infrastructural* as well as *Information System-oriented* facets of e-Learning in international distributed organizations. Following Khan within this area the focus is on *infrastructure (e.g. technological and technical capabilities, standardized interface descriptions), hardware (e.g. computers, servers, wireless devices), software (e.g. learning management system software, authoring tools)* as well as *Information System design (e.g. usability issues, information support design, interface design)* topics. The analysis of the case study shows especially the need for dealing with *collaborative usability* of e-Learning in design and production as well as learning and teaching situation.

The **pedagogical** domain directs the issues are driven by *psychology in education (e.g. basic concepts on learning, instructional strategies), adult education (e.g. curriculum)* as well as by *pedagogical concepts in context of teaching and learning with new media (e.g. Blended Learning).* It fully respects Khan's topics like *content* and *audience analysis, media analysis* as well as the *design approach.* From the author's point of view

At least the **socio-ethical** deals with socio-, individual- and culture-driven issues do influence the usage and the effectiveness of e-Learning programs in international acting organizations. It is logical to imagine that this domain does have enormous influence especially by using e-Learning programs for international trainings as done in the analysed cases within the BMW Group. Topics are seen within this area follows the basic investigations of Hofstede [11] and his understanding of *cultural consequences* do exist by differences in values, behaviours, institutions for organizations across nations. In time of *globalization* and the progress of using collaborative media like Internet or Twitter issues like the *digital literacy* should be minimized but still are existent for respecting it in deciding and designing of e-Learning programs. The case study underlies the research here has shown that socio-ethical differences like *language-differential, learner diversity, educational culture differential, learning style differential, reasoning pattern differential, high-and low-context differential* or *social context differential* influences the effectiveness for e-Learning [10]. Also in this domain Khan's findings and topics (*social and political influence, cultural diversity, bias, geographical diversity, learner diversity, digital divide, etiquette, legal issues)* show fully adequateness. It might be stated that the socio-ethical diversities may occur on different levels.

4) *Element 3: E-Learning Success Paths*

One of the core insights the conducted case study research brings is the existence of **e-Learning Success Paths**. These success paths do show the heart of the maturity and management framework. An *e-Learning Success Path* is a typical *cause-effect-chain* for successful design, production, launch, execution and evaluation of e-Learning in international acting organizations. Knowing the success paths existing in general and individually for *effective and efficient* use of e-Learning in such organizations will offer a *crank* to

manage and control it over its different life cycle stages and processes. The concept of a success path respects the elements *critical success factor, key performance indicators, concernment levels* as well as *methods and instruments* for the operative management of it. A number of 71 different success paths where observed within a previous case study research. The observation and mapping of real life situations happened on reviewed and mentioned catalogue of factors and indicators [3] exist in multi-discipline literature about e-Learning. **Figure 5** provides an overview for the basic theory of *e-Learning Success Paths.*
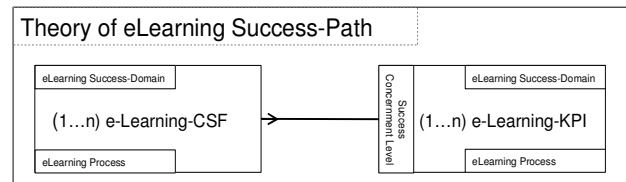
Figure 5. Basic theory of e-Learning Success Paths

In general this theory bases on the principles of *cause-effect-chains.* The causes are expressed by so called *e-Learning Critical Success Factors* which regards to one or more processes and domains and influence directly or indirectly one or more *e-Learning Key Performance Indicators.* Each of these indicators does also regard to one (or more) processes and domains. Additionally the effect of treating an influencing factor (is shown in the indicators status) might be differentiated after different *Success Concernment Levels.* A concernment level offers the classification after *individual, institutional* or *instructional* success or failure. Concept behind this is to make a difference of the impact of managing a success path has to be made (also in political sense). For example neglecting the concept of *collaborative learning* had shown negative effects on the *individual satisfaction* of the learners but also shows effects on the *institutional business process performance.* The above-described case study research provides following summarizing statements on the domain-specific success paths:

General Success Path

1. It can be argued that a general *goal-setting* for the intended e-Learning program *from all stakeholders and customers* (learners and instructors) point of views does have *influence* on the immediate transparency of the e-Learning project as well it guides the whole project and usage processes and brings therefore benefits for.
2. The observations show, so clear the intentions, goals and planning so higher is the degree of general customer *satisfaction* concerning the effectiveness the e-Learning program.

Institutional Success Path

1. E-Learning as an educational method and solution is an issue which success depends on the organization *management attention*.
2. E-Learning management might consider the general institutional treatment in sense of *macro management* of it as a concept for general training and knowledge management.
3. E-Learning management does have a *micro management* element, which occurs on each individual e-Learning program.
4. The availability of e-Learning programs is not a pure technological issue; within the *organizational structures and communication* channels e-Learning has to find its permanent standing.
5. Respecting the *influence of the institutional* issues offers the opportunity for increased efficiency in time, quality and cost in the business processes.
6. Respecting the *institutional aspects* does show effects in *pedagogical, institutional* and/or *technological domain*.

Pedagogical Success Path

1. *Collaboration*, *communication* and *interaction* as well as the *in-depth analysis of the audience* in the investigated organizational learning processes leads to positive effects like course *satisfaction* and *improvement of business processes*.
2. The *selection of the content* as well as the *professionalism of the content development process* is shown by the existence of excellent concept (storybook) documents and results in *high information quality*.
3. The choice of *adequate instructional design* (esp. in intercultural context) and *high instructional quality* leads to *improvement of daily activities* by *reduction of failures* and positive *reaction of international audience*.
4. At least the *reduction of complexity in e-Learning concepts* and solutions in direction of pedagogical issues leads a *better transfer of information* to the audience.

Technological Success Path

1. *Information Technology* is an *enabler for pedagogical concepts*.
2. It enables *flexible learning organizations* and does have i*nfluence on existing spending for travelling* by access to learning material.
3. It *influences the learning score*.
4. Infrastructural differential
5. *Authoring Tools* enables an *efficient content development process*.
6. *Technological issues* are part of and *influence the quality of e-Learning concept papers*.
7. The basic attitude of learners concerning Information Technology (*digital literacy)* use in learning and teaching processes influences the reaction and acceptance of learning materials created this way.

Socio-Ethical Success Path

1. Especially in international acting organizations the *concept and content of e-Learning programs might respect cultural and individual learner differences*.

2. Modern Information & Communication Technology might be used to enable *adaptation activities* (minimum for contents, maximum for teaching and learning styles) covering these diversities.

The effects of *respecting content and cultural differences* are the *availability of adequate content and training material* which leads to *training effectiveness* for the whole organization.

5) Element 4: Management Methods and Instruments

Beside the previous description of the basic elements this document also offers a description of the management *methods* are from the authors point of view adequate in the complexity of international acting organizations. *Methods* (e.g. capability maturity management, performance measurement, balanced scorecard, process management, project management) mean the general logical concept for the management of the complex of e-Learning processes domains and success paths whereas *instruments* actually describe tools (e.g. guidelines, how-tos, FAQ, checklists, reports, software) for the actual and operative realization. The model concentrates on the *management* of e-Learning as a comprehensive concept for international acting profit organizations. General and basic question for the *methods* and *instruments* in that complex is; which kind is compatible to the practical management behaviour in today's professional profit-organization and which fits into specific process and time sequence of e-Learning. Bringing transparency into this question first it is necessary to differ with e-Learning between three different use cases (stadia):

- **First Decision & Set-up stadium**: Within this stadium the organization has not implemented and used e-Learning to the point of time evaluating it as solution for future knowledge management, development and training within the international acting organization. In that entity the management of e-Learning in *macro* (e.g. setup of whole infrastructure, decision for basic curricula as well as institutional, technological, pedagogical and socio-ethical basic assumptions) as well as the *micro* management (e.g. selection of specific contents and context, design of e-Learning programs till usage and assessment of it) is necessary.
- **Incremental stadium**: Within this stadium the organization still has implemented the basic infrastructure for e-Learning and adds new e-Learning programs or adapts existing one. The characteristic in that stadium is, that the system still runs and the management is mainly needed in the *micro*-sense, e.g. for re-implementing parts of the existing e-Learning programs or producing new e-Learning programs.
- **Re-design stadium**: Also in this stadium the organization still has implemented e-Learning and operates it over a critical sequence of time. Similar to the *first move stadium* the management concentrates on the *macro* as well as *micro* management issues entirely. In sense of the *macro* management all e-Learning assumptions within the specific organization finds an comprehensive assessment and re-design not at least because of general re-orientation and business re-design in the target organization. This may also lead

to the re-design of specific e-Learning programs as well as *micro* management approaches and assumptions.

Considering these stadia, it is obvious that the need for a *mixture of methods* and therefore for the *instruments* exists. Abstract management *methods* and their relating *instruments* are in focus of the *Cybernetic e-Learning Management Model* are *Strategy Management, Process Management, Project Management, Maturity Management*, *Controlling* and *Quality Management. Table 8* gives an overview over the mapping of these methods, the relating instruments with the use cases e-Learning management is typically applied in.

Management Methode	First Move & Incremental	Re-Design	Goals	Instruments
Strategy Management	y	n	y	Definition of the e-Learning Strategy for reaching the overall organizational goals.	- D&T Strategy and Curriculum - Instructional Strategy - Technology Roadmap - Service Sourcing Strategy
Business Process Management	y	y	y	Definition of activities, responsibilites and interfaces (organizational & activity-driven) for the, for e-Learning necessary activities.	- Individual e-Learning Process Model - e-Learning Organization - Analysation - Optimisation - Performance Measurement
Project Management	y	y	y	Management of e-Learning activities under consideration of time and budget goals	- Activity Planning and Time Scheduling - Resource Management - Project Review - Budget and Result Tracking - Project Meetings and Gate-way Management - Change Control Board
e-Learning Maturity Model	y	y	y	Measurement of capabilities and maturity of e-Learning in the specific organizational setting.	- ex-post measurement of e-Learning situation - Benchmark of maturity - Deduction of optimisation activities
Balanced Scorecard	y	y	y	Reporting of performance of e-Learning and simulation of e-Learning performance by changing assumptions and planning parameters.	- ROI calculation - Reporting - Simulation
Quality Management	n	y	y	Management of the e-Learning content as well as system quality.	- Quality Gate-ways - Quality Measurement - Quality Reporting

Table 8. Mapping of management methods to use cases, goals and instruments

IV. Conclusion and Further Research

The mid-termed case study research which insights and results are expressed through this document might be seen as a good progress for the overall research goal of investigating the success of e-Learning and derived methods and instruments for science and practice.

The *Cybernetic e-Learning Management Model* provides a framework for the structured and straight handling of e-Learning as a complex issue in a complex world of international acting organizations. It respects the fundamental elements, addresses the complexity of reality and directs this to *manageable* success paths. This document shows the creation of the model. The created model is for organizations do show the character of international activities and complex facets in socio-ethical, technical, institutional as well as pedagogical field. The structure and insights coming from this research might the e-Learning approaches and systems exist in different stadia within such organizations.
In further research…

- the model might be tested for applicability and further detailing in its elements (especially on the instruments and tools level) as well as proving the general approach,
- the constructs of the mentioned success paths have to be investigated in further detail that will be respected in future releases of the Cybernetic e-Learning Management Model.

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