STANDARDS CREATION INVOLVEMENT IN A LARGE TELECOM PRODUCT DEVELOPMENT COMPANY: A GROUNDED THEORY

by

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ABSTRACT

Product development companies engage in standards creation since standards influence timely development, introduction and acceptance of their products. For a telecom product supplier, standards involvement becomes critical since standards are essential for interworking and interoperability across telecommunication systems. Drawing from twelve archived standards stories, fifteen standards practitioner surveys and six completed standards creation research cases, the research develops a grounded theory to account for *success measures* and *success factors* for standards creation involvement in a large telecom product development company. The research identifies a typical telecom standards creation lifecycle. The research proposes seven *success measures* and nine *success factors* of standards creation involvement in a large telecom product development company. It also identifies nine *circumstances* that mediate the effect of *success factors* on *success measures* of standards creation involvement. Finally, the research proposes evaluation criteria that standards practitioners can apply to predict likelihood of success of standards creation involvements and identify potential issues.

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1 INTRODUCTION

Products and services of companies operating in rapidly changing industries such as computing, electronics and telecommunications are highly interdependent on standards. Standards creation involvement can have significant impact on a company's activities leading to product conceptualization, high level design, design refinement and implementation as well as its business strategy. While the strategic importance of standards has been considered and some progress has been made in understanding it, empirical research efforts have mainly been limited to the economic factors, the formal rules and procedures, and leadership in standards committees. Little has been established about factors that influence standards creation involvement and measures that determine success of such involvement. This research considers *success factors* as company-level and industry-level actions that lead to a successful standards creation involvement and *success measures* as company-level and industry-level outcomes that are deemed to be successful.

1.1 Research Problem

Develop a theory for success measures and success factors of standards creation involvement in a large telecom product development company.

The solution is a grounded theory of *success measures* (both company-level and industry-level) and *success factors* (both company-level and industry-level) of standards creation involvement in a large telecom product development company. These are summarized in section 1.4 and detailed in section 5.

1.2 Methods Overview

The research design used for this research was multiple case study (Yin, 1989) using grounded theory (Glaser and Strauss, 1967; Christensen et al., 2002) and qualitative cross-case analysis (Miles and Huberman, 1994).

The unit of analysis was a standards creation project completed in a large telecom product development company. Six standards creation projects in the selected company were examined as independent cases that helped to confirm emerging conceptual insights. The primary data were detailed interviews with individual respondents who had been actively involved with one of the six cases. These individuals provided both standards perspective and product perspective in most cases. Interviews were conducted according to accepted interviewing best practices (Foddy, 1993). The lines of inquiry were built from detailed survey responses from standards practitioners priming thirteen on-going and two recently completed standards creation projects in the same company. These survey responses were collected using two survey instruments which were build using twelve archived standards stories available with a central standards group in the same company. The elements comprising the measures and factors associated with the standards creation involvement were continually refined during the course of the study.

The underlying method used for this research was grounded theory building approach as it is appropriate for investigating rarely explored phenomena for which extant theory is not applicable. It was expected that grounded theory building approach would lead to unique and comprehensive insights that would allow exploring this new area of research and proposing a grounded theory.

1.3 Contribution

This research is relevant since significant investment is made in standards creation by a large telecom product development company to ensure new product success. However, the rate of new product success is distressingly low (Goldenberg et al., 2001; Debruyne et al., 2002). Since standards form an integral part of overall product strategy, top management teams are interested in *success factors* and *success measures* for standards creation involvement such that the likelihood of success can be determined and the investment can be focused on involvements that are likely to succeed.

This thesis makes the following contributions:

- Identifies a typical telecom standards creation lifecycle that can be referenced by standards practitioners to establish the status and consequent actions of their on-going activities.
- Provides means for standards managers to predict likely success of on-going standards creation involvement and determine correct involvement plan.
- Proposes evaluation criteria for standards managers to determine potential issues with a standards creation need before embarking upon it.

1.4 Summary of Key Findings

This research takes into consideration six different dimensions of standards involvement introduced by Baskin et al. (1998). These dimensions are based on key questions that need to be addressed as part of standards process: *why* seek a standard, *what* needs to be standardized, *when* should standardization occur, *how* will standardization occur, *who* will conduct the standardization, and *where* will standardization occur? Sheriff and Sparrell (1992) classify the issues encountered during

standards setting as strategic and tactical. Based on their work, *why*, *what*, and *when* identify the strategic dimensions while *how*, *who*, and *where* identify the tactical dimensions.

In a large telecom product development company, the strategic and tactical dimensions of standards creation involvement are influenced by various company-level and industry-level factors. This research attempts to identify such factors in the context of successful standards creation involvement.

The strategic dimensions involve formulation of a standards creation involvement plan. The tactical dimensions involve the actual execution of the strategic plan. The actions involved with such execution lead to different outcomes at different stages of standards creation involvement. In addition to the *success factors*, this research attempts to identify *success measures* that can be used to determine success of standards creation involvement.

Section 5 details key findings of the research. Seven *success measures* were found to be relevant for a large telecom product development company during its standards creation involvement. These were: a) a complete and accurate standards specification embedded with the company's positions, b) leadership and credibility for the company, c) creation of an ecosystem, d) company's market share within the market, e) vindication of company's research/development efforts, f) learning and gaining experience, and g) return on standards resource investment. *Success measures* relevant for industry in general were: a) a complete and accurate standards enabling widespread adoption of the technology, and b) the creation of a new ecosystem and market for the technology.

Nine *success factors* were found: a) internal coordination, b) alliances efforts, c) company's perseverance, d) compromises made, e) prototyping activities, f) resource selection, g) cross standards body coordination, h) new standards body creation, and i) company's aggressiveness in standards creation involvement.

In addition nine *circumstances* were discovered that were found to mediate the effect of *success factors* on *success measures* for standards creation involvement. These were: a) vendors'/competitors' interest, b) customers' interest, c) pertinent parties' interest, d) company's size and brand name, e) market optimism, f) presence and efforts of a internal mediating group, g) internal funding environment, h) support of executives, and i) industry stability.

Based on the above findings, an emergent theory has been proposed for standards creation involvement in a large telecom product development company. Further, based on researcher's own experience and above findings, emergent theory of *success measures*, *success factors* and *circumstances* of standards creation involvement in a large telecom product development company is proposed. In addition evaluation criteria are proposed for standards managers to evaluate likelihood of success for a standards creation involvement before embarking upon it.

The thesis is organized into six sections. Section 1 is the introduction. Section 2 provides academic literature review and the insights learned from it. Section 3 develops the framework used to anchor this research. Section 4 describes the research method which includes the criteria for sample selection, data collection, and data analysis. Section 5 details the results and findings of this research. Section 6 proposes an emergent

theory of *success factors*, *success measures*, and *circumstances*. Section 7 provides conclusions and limitations of this research, and suggests areas of future research.

2 LITERATURE REVIEW

The literature review encompassed work on standards management and success factors and success measures in project and product development. For the purposes of the review, product development was also viewed as a project. The key question that guided this review was "*What are the success factors and success measures for standards creation involvement in a large telecom product development company?*" Though literature on product development was abundant, literature on success factors and success measures for standards creation involvement was scant. The findings from the literature review are organized in four sub-sections covering standards importance, standards management, success measures and success factors, and other related aspects.

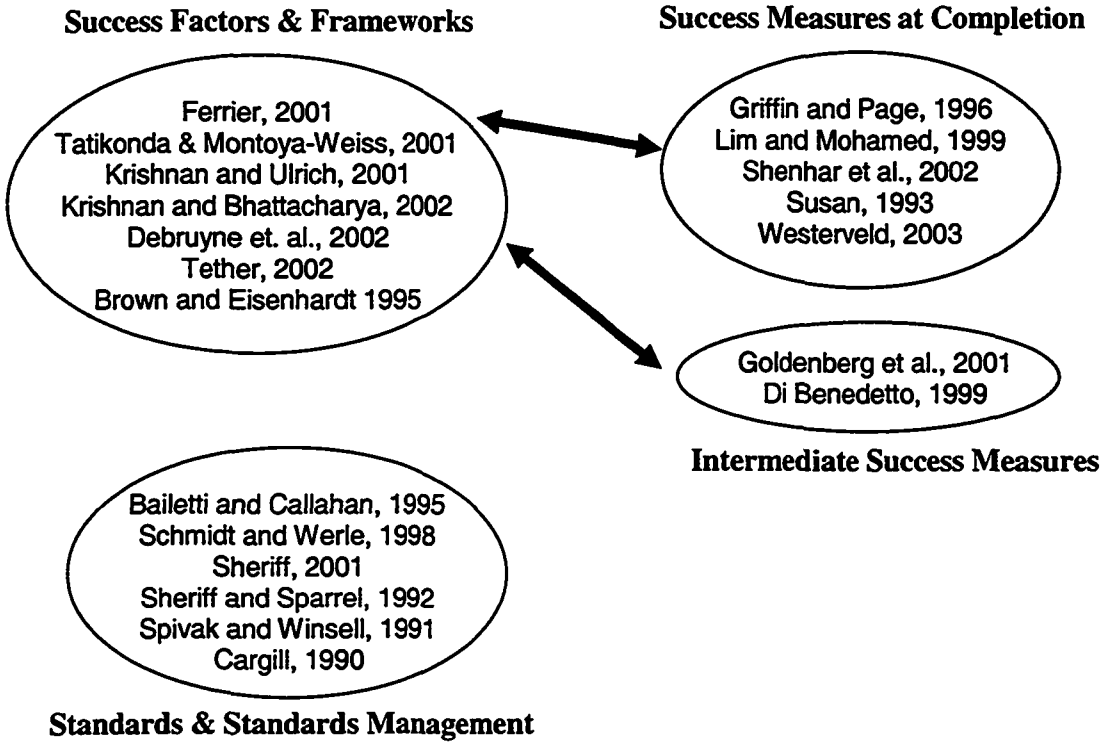

Figure 1: Organization of Literature Review

2.1 Standards Significance

The relevance and demand of standards has been increasing in telecommunications and information technology industry. As observed by Cargill (1990), in the computer industry, new standards can be a source of enormous wealth or the death of corporate empires. With so much at stake, standards arouse violent passions.

Different categories of standards have been established. Spivak and Winsell (1991) define three categories of standards: *de-facto*, *government* (*regulatory*) and *voluntary* standards. Out of these, *voluntary* standards are usually developed by a consensus process for voluntary use and are established by involvement of product vendors, network operators, service providers and end users. Sheriff and Sparrell (1992) also highlight the role of *bystanders* that have no vested interest in specific details but are experts in the field and prefer a "good standard" in terms of performance, ease of use and cost. Cargill (1990) points out that *regulatory* standards are slow and careful though standardization changes have occurred with the industry; the industry now rewards speed of change and acceptance of innovation. This particular aspect leads to a need to investigate how the product development companies are impacted, and if at all rewarded, through their involvement in public standards creation.

Sheriff (2001) establishes that standards can be categorized as *anticipatory*, *participatory*, or *responsive* with respect to the product or service life cycle. Langlois and Savage (2001) focus on behavioral standards, where standards are recurrent patterns of behavior those help to co-ordinate human activity, and establish two classes of standards: a) those that create scalable economies, and b) those that lower transaction costs. The relationship between the *enabling* and *constraining* aspects of standards and

technological focus of the industry is applicable to telecom product development companies. To strike a balance between *enabling* and *constraining* aspects, it is recommended that standards "just embed" within the technological matrix that these standards enable. As the degree of modularity determines pace and direction of technological change in a system, standards can address different kinds of modularity: *architectural* vs. *modular* innovation and *systemic* vs. *autonomous* innovation.

The standards setting process is evolving. Vercoulen and Wegberg (1998) highlight a shift from a purely market-based selection of standards or a purely negotiated selection of standards, to a hybrid selection process, where both market competition and negotiations play a role. While the market decides the evolution of incompatible standards in a market selection mode, committees or alliances drive the negotiated model. A need for a framework is realized to understand and predict how companies develop mechanisms for selecting standards and how companies alternate between competition and cooperation during the evolution of public standards.

2.2 Standards Management

Standards management and the role of standards strategy as a strategic component have been researched. Bailetti and Callahan (1995) provide valuable insights into how standards strategies can be designed and implemented effectively. Standards strategy is defined as a plan to achieve consistency between product development and public standards evolution. Five different standards management structure models have been proposed based on six different goals in standards strategies. Schmidt and Werle (1998) offer three case studies from telecommunications industry to highlight the roles and influence of actors, politics, process etc. in standards creation.

Standards creation can be a multifaceted and complex process. Sheriff and Sparrell (1992) provide an important framework for standardization in telecommunications and information technology. The coverage of strategic and tactical issues provides a good foundation for understanding six different dimensions of standards, introduced by Baskin et al. (1998). These dimensions are: 1) *why* seek a standard, 2) *what* needs to be standardized, 3) *when* should standardization occur, 4) *how* will standardization occur, 5) *who* will conduct the standardization, and 6) *where* will standardization occur. Sheriff and Sparrell (1992) also provide a predictive model that matches the timing of standards to the intrinsic capabilities of the technology using the technology S-curve. The models account for timing issues in context of overall players in standards involvement but do not address the impact on product development companies.

2.3 Success Factors & Measures

Success is often difficult to measure. This is supported by Griffin and Page (1996) who define success as not just elusive, but also multifaceted and difficult to measure. Lim and Mohamed (1999) emphasize consideration of different perspectives for success measures which vary across different users. Shenhar et al. (2002) employ a multivariate approach to account for all the interactions between managerial and success variables and to address a handful of perspectives. They recommend a project specific typological approach for project success measures as opposed to universalistic approaches employed by other researchers. Similarly, Susan (1993) claims that there is little consensus in the literature on how to operationalize success and highlights variety of measures and levels of analysis that researchers have employed.

Attempts have been made to operationalize success measures by categorizing them. Recognizing that no single measure suffices for gauging the success of every product development project, Griffin and Page (1996) propose that most appropriate measures of project-level and program-level success depend on the company's project-strategy and business-strategy respectively. They categorize the project-level success measures as: a) customer-based success, b) financial success, and c) technical performance success; while program-level success measures are identified based on different business-strategies, which are categorized as: a) prospector, b) analyzer, c) defender and d) reactor. Similar to the categorization of project-level and program-level success measures, Lim and Mohamed (1999) propose to classify the success measures as: a) the *micro* viewpoint, and b) the *macro* viewpoint. While both *completion* and *satisfaction* are proposed as criteria for the *macro* viewpoint of project success, *completion* is viewed as sufficient criterion for the *micro* viewpoint of project success. Shenhar et al. (2002) further recommend a project specific typological approach for project success measures as opposed to universalistic approaches employed by other researchers. Similar to Lim and Mohamed (1999), they emphasize that since project outcome is assessed differently by different stakeholders; success measures must reflect different interest and viewpoints – which leads to a multidimensional, multi-criteria approach. Based on studies into corporate performance, Susan (1993) provides a typology of different success measures associated with new product development.

Interdependence among the success measures has been acknowledged. Griffin and Page (1996) acknowledge that often, some level of success in one dimension may be sacrificed to achieve success in others. This also points out that success measures or a set

of them may be unique to each given stage of activity in question since the strategy employed may differ among different stages.

The relationship between success measures and related success factors has also been studied but not in specific context of standards setting. Westerveld (2003) proposes a *Project Excellence Model* to relate the critical success factors to project success criteria. This model consists of six result areas covering project success criteria and six organizational areas covering critical success factors. It refers to so-called golden triangle of time, budget and required quality as being the success criteria but indicates that this represents a "narrow" view since project success can be identified as satisfaction across all stakeholders. Shenhar et al. (2002) identify stronger success measures and project specific managerial variables, e.g. origin of idea, formal procedures, project milestones, financial management, design phases, organizational structures, design reviews, etc.

The literature also highlights a reinforcing effect among different stages of product development. Lim and Mohamed (1999) highlight that past *sins* (inadequacies) of preceding phases manifest themselves in each subsequent phase of a project. This highlights the importance of addressing early success determinants before it becomes too late. Goldenberg et al. (2001) focus on ideation phase and address early determinants of new product development success. The early analysis framework allows estimation of likely success before significant resources are invested into development and production.

2.4 Other Related Aspects

Ferrier (2001) provides a general research model in context of drivers and consequences of competitive aggressiveness. This method offers an important tool that allows integration of success factors and success measures into a single framework. This

framework allows analysis and study of often complex and multi-dimensional factors, serving as antecedents, and measures, viewed as outcomes or performance, along with different dimensions of specific research aspect in consideration.

3 RESEARCH MODEL AND THEORY

3.1 Research Model

The objective of this research was to identify the *success factors* and *success measures* for standards creation involvement in a large telecom product development company.

Figure 2 illustrates a model used by the researcher for this research. This model assumed that *actions* taken by the company during standards creation involvement influenced standards creation involvement *success*. *Actions* were assumed to be specific steps taken by the company at the start and during the standards creation involvement. Standards managers and standards participants were assumed to be responsible for undertaking these *actions* by making choices from among different alternatives. Such *actions* were assumed to be targeted towards achieving *success* in the standards creation involvement. Further, it assumed that company-level and industry-level *circumstances* mediated the effect of *actions* taken on the *success* of standards creation involvement. These *circumstances* were assumed to be present at the start of a standards creation involvement and could not be altered. *Circumstances* were expected to be either enabling or constraining factors, and those *circumstances* which facilitated the *actions* and *success* of standards creation involvement were of specific interest for the purpose of this research.

Company's *actions* that were not visible outside the company were termed company-level *actions*, while *actions* which were visible outside were termed industry-level *actions*. Similarly, *successes* which benefited the company were termed company-level *successes*, while *successes* which benefited the industry were termed industry-level

successes. Finally, company specific *circumstances* were termed company-level *circumstances*, while industry specific *circumstances* were termed industry-level *circumstances.*

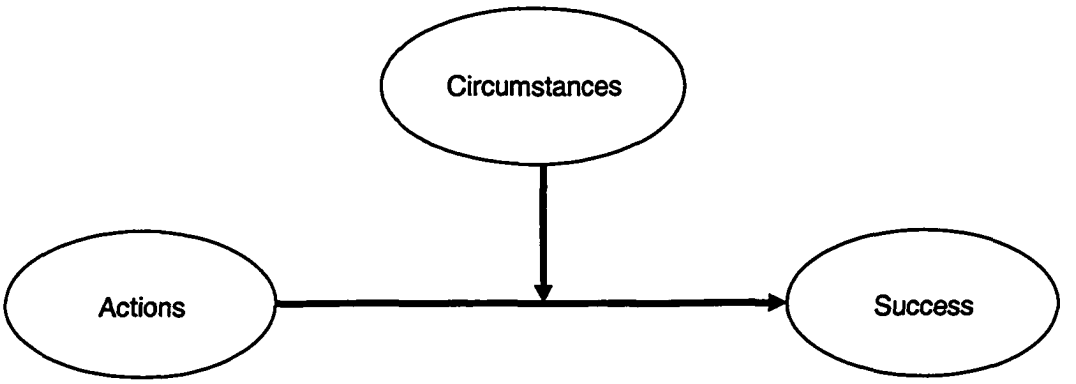

Figure 2: Research Framework

This model allowed the researcher to look for answers to the following research questions: a) what are the relevant *circumstances* for standards creation involvement, b) what are the relevant *actions* for standards creation involvement, c) how does one measure standards creation involvement *success* and d) how are these constructs (i.e. *circumstances*, *actions* and *success*) related?

For the purposes of this research, company-level and industry-level *actions* taken by the company that lead to a successful standards creation involvement were called *success factors.* Similarly, company-level and industry-level *successes* perceived by different stakeholders associated with a standards creation involvement were called *success measures.*

Since *success factors* and *success measures* for standards creation involvement were not well established in current literature, this research used multiple case study (Yin, 1989) using grounded theory (Glaser and Strauss, 1967; Christensen et al., 2002) and qualitative cross-case analysis (Miles and Huberman, 1994). Grounded theory building approach was appropriate for investigating rarely explored phenomena for which extant theory was not applicable. The emphasis of this inductive-mode research was to build theory directly from observed data, as per the inductive process highlighted in Figure 3. Though it would have been possible to go through a deductive process to validate the theory, established as per inductive step, this research limited itself to generation of hypotheses and theory building.

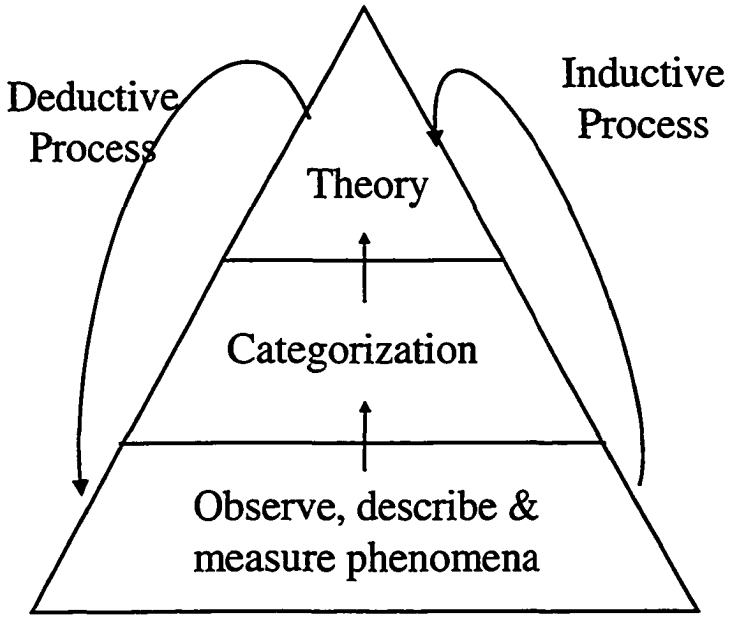

Figure 3: Christensen's Theory Building Process

As already mentioned in section 2.3, *success factors* and *success measures* could be made operational by categorizing them. Based on the above observations and Christensen's grounded theory, steps followed in this inductive-mode research were:

- Data was gathered for standards creation involvement in a large telecom product development company.
- A typology of standards creation involvement was created i.e. categorization of standards creation involvement was carried out.
- Based on data analysis, *success factors* and *success measures* were established across typology of standards creation involvement.
- Theory based on the above detailed analysis was proposed.

4 RESEARCH DESIGN

The literature review in section 2 indicated the significance of standards creation involvement for a large telecom product development company. However, no dominant paradigm or generally accepted theory for *success measures* and *success factors* was found among researchers or standards practitioners. As a result, grounded theory building approach was used to explore standards creation involvement and to build theory for *success measures* and *success factors*, in a manner similar to those recommended by Eisenhardt (1989) for new topic areas.

4.1 Methods

The unit of analysis was a standards creation project completed in a large telecom product development company. Standards creation project was identified as the involvement of the selected company in creation of a public standard, where the creation had been initiated either by the company in question or its competitors.

Six cases were examined as independent studies that helped to confirm emerging conceptual insights. The primary data were detailed interviews with individual respondents who had been actively involved with the one of the six selected standards creation projects. These individuals provided both standards perspective and product perspective in most cases. Interviews were conducted according to accepted interviewing best practices (Foddy, 1993) and each interview was taped and transcribed. Lines of inquiry were built from detailed survey responses from standards practitioners of fifteen different standards projects in the same company. Thirteen of the fifteen surveyed respondents were responsible for on-going standards creation projects while two other respondents had been responsible for recently completed standards creation projects. The

survey instruments used for on-going and completed standards creation projects were build using archival standards data on twelve past successful or failed standards creation involvements and distilled standards process guidelines that were available with a central standards group in the same company. The elements comprising the measures and factors associated with the standards creation involvement were continually refined during the course of the research.

Figure 4 is a simplified diagram of the research method employed in this study. The model followed the research stages recommended by Eisenhardt (1989). As suggested by Figure 4, the execution of these stages was highly parallel and iterative.

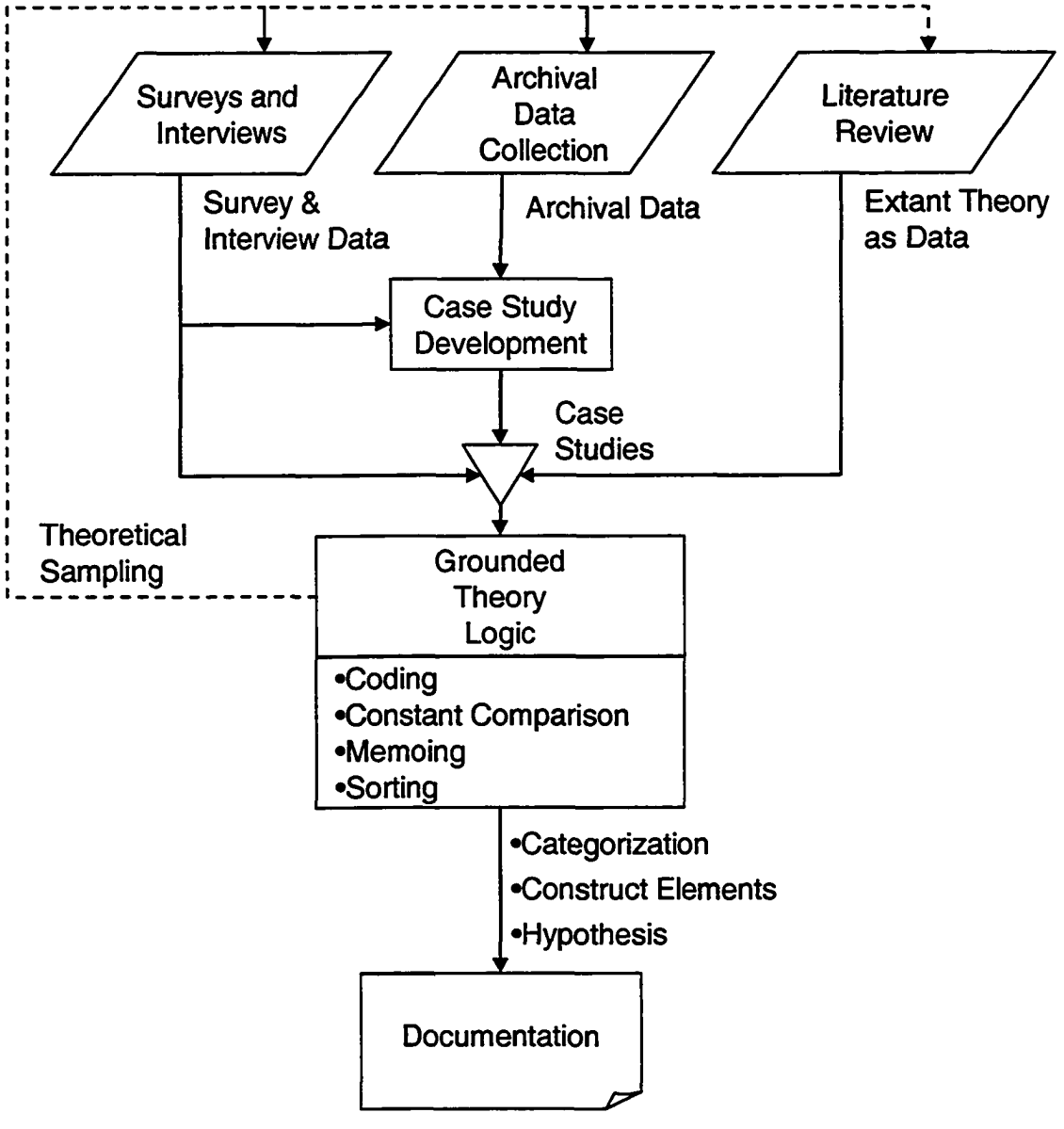

Figure 4: Research Method

4.2 Preliminary Work

After defining the research question, a literature review was carried out. The reviewed references were mainly focused in the areas of: a) standards and standards management, b) *success factors* and frameworks, c) *success measures*, and d) other relevant themes that seemed applicable to the lines of inquiry. The key findings from the

literature review have been described in section 2. Based on the findings of the literature review, a research model, as introduced in section 3, was developed. The findings of the literature review were applied along with the archival data to test the lines of inquiry during the written and/or interviewed surveys with standards practitioners in the selected large telecom product development company. One of the key objectives of archival data collection was to establish an initial data collection framework. Appendix A provides the template that was developed as a result of analyzing archival standards data. The process involved in developing the template was to observe elements of interest within twelve archival cases and distilled standards process guidelines as per the research model introduced in section 3.1.

Each of the archival case was coded and these codes were catalogued manually in a Microsoft Excel spreadsheet. Codes were classified under the following sections:

- Company-level dimensions e.g. business pros/cons, product pros/cons, challenges, etc.
- Industry-level dimensions e.g. related standards activities, regulatory conditions, customer and competitor alignments, challenges, etc.
- *Circumstances*
- Standards involvement dimensions related to execution plan
- *Success measures* which were identified as targeted outcomes

The catalogued information was further updated using the distilled standards process guidelines that were available within the company. Based on this analysis of preliminary data, two separate survey instruments were created. One survey instrument

was created to collect information about on-going standards creation projects in the company. The other survey instrument was created to collect information about recently completed standards creation projects in the company. The purpose of these surveys was to collect information from standards practitioners in the company to augment the data set and develop lines of inquiry to be used later in the multiple case studies. Initial feedback on the survey instruments was collected by carrying out two pilot surveys for each instrument. Respondents for these pilot surveys were standards managers responsible for coordinating standards activities in the company. The survey instruments were updated based on the feedback received during these pilot surveys.

Upon request, the standards managers also provided a list of nineteen on-going standards creation projects in the company. Standards primes for each project were contacted via email to request their participation in the survey. Thirteen standards primes responded and agreed to participate. Initially, an email with the survey instrument for on-going standards creation projects was send to the thirteen respondents. The respondents were requested to return completed surveys within three weeks. However, only four respondents managed to send their responses within the deadline. Due to the low number of timely responses, the researcher contacted each of the remaining nine respondents and offered to carry out an hour interview instead. The respondents agreed for interviews which were later scheduled with each respondent based on his/her convenience. The researcher found that the interview approach worked better as the surveys got completed in a timely manner and feedback received during the interviews helped to improvise the survey instruments further. Appendix B contains the final version of the survey instrument that was used to collect information related to the on-going standards projects.

During the interviews, two respondents also mentioned about recently completed standards creation projects that they had been responsible for. These two respondents were requested to further help in completing a survey for completed standards creation projects. Appendix C contains the final version of the survey instrument used to collect information related to recently completed standards creation projects. Surveys for recently completed standards projects were carried to validate the lines of inquiry for completed standards creation projects before undertaking the case studies.

A list of candidate cases was also developed with the help of standards practitioners. Each survey respondent was also asked to cite examples of significant standards creation projects completed inside the company that were perceived to be successful. The list of such citations was reviewed by the standards managers who were able to provide names of key standards participants that had been responsible for these projects and were still accessible for potential case interviews. The cases were eventually selected from this reviewed list as described in section 4.3.

4.3 Sample Selection

Cases were selected using theoretical sampling with the goal to sample towards saturation and theoretical completeness. The selected standards creation projects represented significant completed standards creation involvements of the company. A total of six cases were targeted at the proposal stage. This was in line with the recommended four to ten cases for case-based management research (Eisenhardt, 1989).

All the cases were limited to a single large telecom product development company to control the applicable dimensions of standards creation involvement (Sheriff

and Sparrell, 1992) and to focus on *success factors* and *success measures* during the first inductive-step of the grounded theory development (Christensen et al., 2002).

There were two main motivating factors for selecting this large telecom product development company. First, it had been prominently involved in a number of public telecom standards created in the past and therefore the finding promised to provide insights atypical to a large telecom product development company in general. Second, the accessibility of the researcher to the respondents and to the applicable standards data offered a convenient sample space for the researcher.

After the initial preliminary work introduced in section 4.2, the data from the survey responses provided lines of inquiry used in the interviews to collect the primary data on standards creation involvement. From the list of significant and completed standards creation projects, developed with the help from the survey respondents and standards managers, an initial sample of two cases was selected for which knowledgeable respondents with standards and/or product perspectives were accessible for detailed interviews. The targeted respondents for the cases included: a) a standards prime or leader directly involved and responsible for the completed standards creation project, and/or b) a product prime or leader directly involved and responsible for the completed standards creation project. To further enhance the lines of inquiry to be used in the interviews, the researcher also collected archival information related to the selected cases. The archival information on selected standards creation projects was mostly gathered from public domain i.e. Internet using search engines.

After the data on the first two cases were collected and partially analyzed, two more cases were selected based on their potential to further extend the emergent theory.

Their potential was determined based on the fact that these were again perceived to be significant public standards in which the company had demonstrated significant interest and were associated with a new technology area. After the data on these additional cases were collected and analyzed, the final two cases were selected such that they complemented the previous four cases in the following manner:

- The final two cases were also associated with a new technology area.
- Both cases were also significant and perceived to successful for the company.
- In the previous four cases, three cases turned out to be those where the company had initiated the public standards creation activity while there was only a single case, where the public standards creation activity had been initiated by the company's competitors. In the final two cases the standards creation activity had been initiated by the company's competitors.

The selected six cases did not overlap with any of the standards creation projects covered during the preliminary work, i.e. the archival standards data and the surveyed projects. Similarly, the respondents selected for the case studies did not overlap with the survey respondents of the preliminary stage. The overlap was intentionally avoided to prevent any biases from the preliminary stages to creep into the primary data of the research.

4.4 Data Collection

Appendix D highlights the lines of inquiry used during each interview carried out with the case study respondents. The data on each case included:

- Transcribed interview script of at least one key standards creation involvement participant.
- Archival information on particular public standards history and timeline from standards bodies' web sites, standards press releases and media coverage.
- Relevant remarks from other interview respondents.

The format of each case study interview was semi-structured, with some open-ended questions to establish a general context and perspective, and probing questions to establish details, conducted according to accepted interviewing best practices (Foddy, 1993). In general, the objectives of the study were framed at the beginning of each interview and the context of each question was framed by specifying the required perspective. These questions covered the general lines of inquiry established earlier.

A total of six interviews were conducted which included five face-to-face interviews while one was conducted by telephone. The interview duration ranged from 45 minutes to 75 minutes, with a typical duration of approximately 60 minutes. Each interview respondent had been intimately involved with the company's involvement in the standards creation and was able to bring both standards and product perspective to the table due to their unique positions with the company during the standards creation involvement. Before each interview, the researcher collected archival information from the above mentioned resources and provided to the interview respondent an overview of the research problem and an overview of the interview format.

Each interview was tape-recorded and subsequently transcribed by the researcher. The researcher also took notes of the key-points during the interview which helped to provide continuity to follow-up questions along the established lines of inquiry.

4.5 Data Analysis

Six descriptive case studies were developed. Each case study shared a common format which included transcribed text of the interviews, researcher's notes on the following aspects: a historical timeline of important standards milestones in standards creation involvement, objectives of the standards creation involvement, key lessons learned and respondent's observations on current standards creation involvement trends.

As mentioned in section 4.2, a Microsoft Excel spreadsheet was used to catalogue codes based on preliminary data. This information was continually updated based on collected data. This code list was expanded and refined throughout the preliminary work by adding, eliminating, clustering, and sorting codes based on their frequency of occurrences.

Interview transcripts and researcher's notes associated with the six descriptive case studies were coded and these codes were manually entered into a case-study database in the form of another Microsoft Excel spreadsheet. These codes were classified in the following three main categories:

- Notable company-level (i.e. internal) *actions* taken by the company's standards participants during standards creation involvement
- Notable industry-level (i.e. external) *actions* taken by the company's standards participants during standards creation involvement

- Specific *outcomes* of standards creation involvement that were targeted by the company's standards participants
- Notable other *outcomes* associated with standards creation involvement that were cited as beneficial for the company's interests
- Specific *circumstances*, both company-level (i.e. internal) and industry-level (i.e. external) which influenced the actions of the company's standards participants.

The codes in the case-study database were compared with the codes list from preliminary work. Based on these comparisons, the codes in the case-study database were further refined. Memos were created to capture relationships across different codes that were observed among different cases. Based on the frequency of occurrences, the codes were sorted among each of the categories mentioned earlier. Sections 5.3, 5.4, and 5.5 provide an overview of the results in the sorted manner. After the initial list of codes was developed in the case-study database and their frequency of occurrences was noted, codes were further analyzed to observe similarities and similar codes were combined together. Following this analysis, some codes which occurred only one or two times were eliminated from the final list. The final coding list had a combined total of 49 substantive codes in different aspects of *success measures*, *success factors*, and *circumstances* and other key observations. Appendix E contains the list of substantive codes identified during the data analysis.

Next, data was further analyzed to establish relationship among the different *success measures*, *success factors* and *circumstances*. Memos made during the data

collection and initial analyses were also factored during this stage of the analysis. Section 6.1 provides the results and proposed hypotheses for these relationships.

Short quotes from the interview respondents were included in the descriptive case studies and coding database to capture emotive aspects of the responses that emphasized some key perspectives. Some of these were also included in the final report, as highlighted in section 5.

4.6 Theory Formulation

Memos were created based on the case study database. These memos were maintained in a Microsoft Word document and these memos were continually updated after each update to the case study database mentioned in section 4.5. Each pass resulted in refinement of the codes and categories in the case study database and further refinement of the memos in the memos document.

Once the core categories of the standards creation projects and code list and memos related to the *success measures*, *success factors* and *circumstances* for standards creation involvement in the company stabilized, casual relationships between categories and code list were noted in some case, alternate explanations were sought.

Finally, once the causal relationships between categories and code lists had stabilized and the resulting grounded theory could account for most of the behavior in the observed data, emergent hypotheses were compiled as summarized in section 5.

The extant literature was continually accessed throughout the research design, data collection, and data analysis phases as it became relevant to the emerging relationships. The extant literature hinted on some relationships which helped to improve the theoretical completeness of the grounded theory.

4.7 Reaching Closure

The resultant grounded theory accounts for most of the observed behavior in the six case studies. The data were sufficiently extensive to provide replication of major findings thus strengthening the comfort level of the researcher in proposing an emergent theory.

No significant discrepancies were observed between the practitioners' observations and the case study findings. As a result, the researcher was comfortable with the amount of eventual data collected, which included primary data from the multiple case studies and secondary data from archival standards cases and surveyed standards projects. If any significant discrepancies had been observed, additional data would have been gathered either by asking clarifications from case study respondents or by adding more case studies that promised to shed more light on the discrepancies.

The key findings of the study have been reviewed with the standards managers and practitioners in the selected company. These standards managers and practitioners had expressed interest and provided feedback on some of the key findings. The final report accounts for this feedback which has helped to improve the quality of results.

5 RESULTS

This section provides the results of the data analysis using the methods described in section 4. First, it begins with an overview of the six research cases and the emergent categories of standards creation projects. Second, it presents a typical telecom standard creation lifecycle established during the data analysis of the standards creation cases. Finally, it identifies *circumstances*, *success measures* and *success factors* associated with standards creation involvement in a large telecom product development company.

5.1 Overview of Cases

The six cases were significant completed standards creation involvements within the selected large telecom product development company. These cases were perceived as successful by standards practitioners and survey respondents during the preliminary work. All the cases were limited to a single large telecom product development company to control the applicable dimensions of standards creation involvement (Sheriff and Sparrell, 1992) to focus on *success factors* and *success measures* during the first inductive-step of the grounded theory (Christensen et al., 2002), and to control the variation in the external climate at a company level.

Significant diversity was observed within the data set at the incubation stage of a public standard creation. Incubation stage was the time between the inception of a new technology idea and the start of public standards creation activity, as shown in Figure 5.

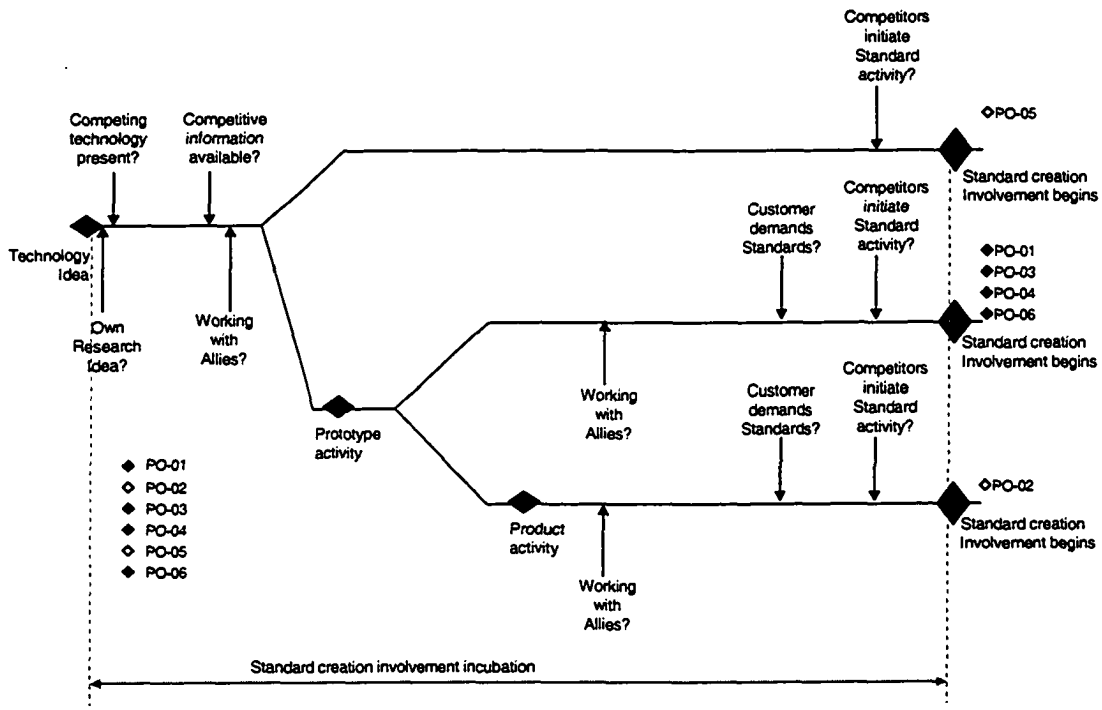

Figure 5: Case Studies Overview during Incubation Stage

The data set offered the following three different paths during the incubation stage based on the differences among the company-level and industry-level activities involved:

- Through some company-level research activities, enough interest was built internally over a period of time to require standards creation. A similar need for standards creation was either developed externally or occurred externally in parallel leading to the company's public standards creation involvement. During this path however, no prototype or product activity occurred. Rather, the need for standards creation preceded prototype and/or product activity. One case was found to have taken this path.
- Through some company-level research activities, enough interest was built internally to invest in prototype activity. Over a period of time, a need for standards creation was either developed externally or occurred externally in

parallel leading to the company's public standards creation involvement. During this path however, no product activity occurred. Rather, the need for standards creation preceded product activity. Four of the six cases were found to have taken this path.

- Through some company-level research activities, enough interest was built internally to invest into prototype activity and later into product activity. Over a period of time, a need for standards creation was either developed externally or occurred externally in parallel leading to the company's public standards creation involvement. Standards creation need followed product activity. One case was found to have taken this path.

Another set of attributes that provided diversity within the data set included:

- In three cases the public standards creation activity was initiated by the company. The remaining three cases were those where the company's competitors initiated the public standards creation activity.
- In three cases a technology competing with the technology being standardized was present within the company.
- One case predominantly involved a software based technology while other cases predominantly involved a hardware based technology.

Even with this diversity, the data set of the six cases was found to be sufficient for the following reasons:

- All six cases were related to standards creation of a new telecom technology.

- In all six cases, competitive information had augmented the company's interest in the technology and later in its standards creation.
- There was a uniform distribution among the cases with regards to who initiated standards creation activity. Three cases were those where public standards creation activity was initiated by the company. Remaining three cases were those where the public standards creation activity was initiated by the company's competitors. This is highlighted in Figure 6.
- Six cases are within Eisenhardt (1989) recommended guidelines of four to ten cases for case-based management research.

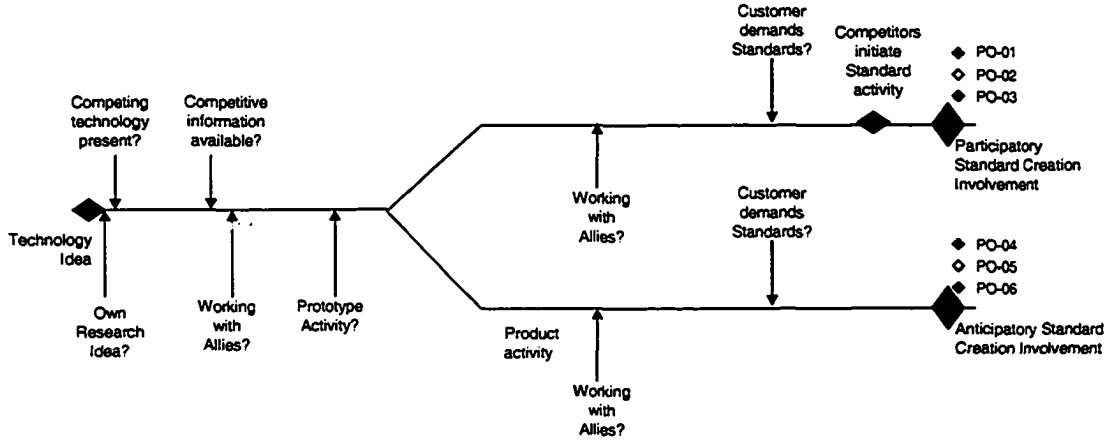

Figure 6: Cases Typology based on Standards Creation Initiation

5.1.1 Typology of Standards Creation Involvement

Though the initial proposed scope of the research had been to explore the *success measures* and *success factors* for standards creation involvement in general, it soon became evident during the course of the research that standards involvement itself can be

of different kinds based on the objectives of the standards involvement. Consequently, the research focused specifically on standards creation involvements, since standards creation was found to involve largest investment both in terms of time and resources.

Further, some other categories of the standards creation involvement were uncovered during the course of preliminary work and analysis of the six cases. Some of these were in line with the extant literature and proposed theory. These were based on the following categorization attributes:

- Level of investment made leading to the following three categories: *Lead*, *Participate*, and *Monitor*.
- Source of standards creation motivation leading to the following categories inline with Spivak and Winsell (1991): *de-facto*, *regulatory*, and *voluntary* standards.

This research, focused on the *voluntary* standards creation activities, found further applicability of Sheriff's (2001) categorization of *anticipatory, participatory, or responsive* standards. Though Sheriff (2001) applied the categorization with respect to product/service life cycle, this study applied the categorization from a company's perspective of standards creation involvement. This categorization was found to be:

- *Anticipatory* standards creation involvement where the company initiates a *voluntary* standards creation.
- *Participatory* standards creation involvement where the company's competitors initiate *voluntary* standards creation and the company feels compelled to participate in standards creation due to its vested interests.

5.2 Telecom Standards Creation Lifecycle

Based on data analysis, a telecom standards creation was found to be a long drawn out process which typically lasted for a period of six to eight years. Typically, the first half of this period was spent to define a stable first version of the standard while the second half was spent in maintaining this standard by addressing inaccuracies, new features, etc. This is identified by *public standards creation activity* and *public standards maintenance activity* shown in Figure 7.

A significant amount of time in standards creation was dedicated to incubating the technology. Eventually the need for a standard was realized and a standards creation activity was either launched by the company or its competitors. The period and activities before the start of a standards creation project in a public standards body is marked as *standards incubation activity*. The period of activity which preceded public disclosure is marked as *private activity* while the activity, once the company disclosed the technology and its interest in standards creation, is identified as *public standards activity* in Figure 7. This typical telecom standards creation lifecycle can be referenced by standards practitioners to determine where they are at any given time in their on-going activities and apply some of the findings of this research to the *standards incubation* and *public standards creation* periods.

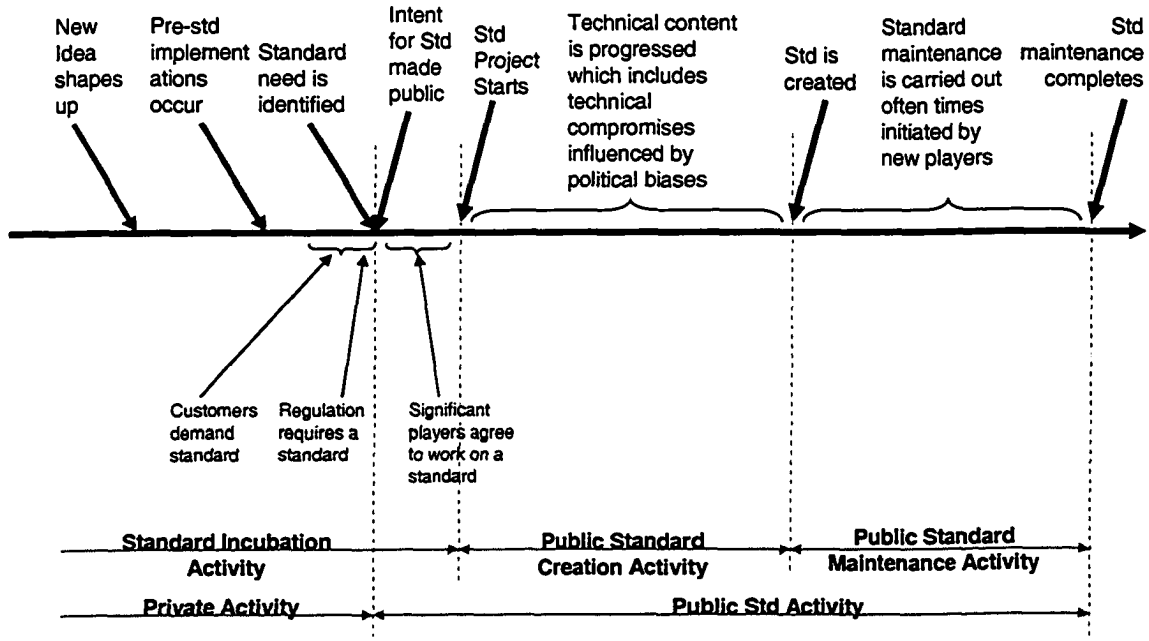

Figure 7: A Typical Telecom Standards Creation Lifecycle

5.3 Circumstances

The data analysis revealed nine *circumstances* that played a significant role in the standards creation involvement cases. These were either company-level or industry-level *circumstances* that were given at the beginning of standards creation involvement and could not be altered. The standards participants had no control over these *circumstances* but found these to mediate their actions leading towards a successful completion of the standards creation involvement. Table 1 provides a summary of these *circumstances*.

Table 1: Circumstances

Symbol	Circumstances	Company-level?	Industry-level?
C1	Vendors'/Competitors' Interest		Yes
C2	Customers' Interest		Yes
C3	Pertinent Parties' Interest	Yes	
C4	Company's Size	Yes	
C5	Market Optimism		Yes
C6	Mediating Group's Presence	Yes	
C7	Internal Funding Environment	Yes	
C8	Executive Support	Yes	
C9	Industry stability		Yes

5.3.1 Vendors'/Competitors' Interest

All cases indicated that before the standards creation involvement, at least some other product development companies, mainly the company's competitors, were also involved with a similar technology. The involvement of these other competitors ranged from research efforts to pre-standards product development. This helped in getting the standards creation activity off the ground in public. In fact, in some instances, the company's competitors were responsible for initiating standards creation activities.

Where standards creation activity was initiated by the company, it had made a prior determination about potential uptake of the associated technology based on its competitive knowledge. In some cases, the external involvement had been limited to one or two vendors/competitors only. However, this interest contributed to building an overall market interest in creating the standard for the associated technology. Involvement of these other vendors/competitors also served to validate the company's own interest in the technology providing it further confidence to commit resources to both technology development and its standards creation.

Where the company's competitors initiated standards creation activity, external interest became evident at the start of standards creation activity.

5.3.2 Customers' Interest

Five cases highlighted that the company's customers had been interested in the technology and its standardization before a public standards creation involvement started. Customer's involvement and interest contributed to bringing other parties on board. As one respondent mentioned:

> *"...that one customer said, this sounds really neat and I would like to see that work and that customer called up some very high level executives in each of the <snipped> companies, <snipped> and said, what's the problem, how can't you guys not give me a single spec or a way that this gets implemented. So that was the ultimate trigger..."*

Close working relationships with existing customers helped to predict viability of newer technologies. Customers' interest in the technology and standardization played a significant role in all three cases where the company initiated standards creation activities. Customers' interest was also found to be a factor in two other cases where the competitors had initiated standards creation activity.

5.3.3 Pertinent Parties' Interest

Five cases emphasized the significance of involvement of all pertinent parties inside the company. This involvement of pertinent parties contributed to the success of standards creation involvement. One respondent summarized the pertinent parties as company's designers, architects, marketing, and standards participants:

> *"...My model is always designers, architect and PLM marketing and standards people."*

In the large telecom product development company, where different product groups were found to be interested in same technology, interest of these parties validated the overall technology direction. Different parties also allowed cross-group learning which helped to clarify specific positions that the company could elucidate during its standards creation involvement. Further, due to close collaboration of pertinent parties, the company was able to optimize and coordinate its resources dedicated for the purposes of standards creation involvement.

5.3.4 Company's Size

Five cases specifically pointed to the role that the company's size and its associated brand name had played during its standards creation involvement. Due to its size, the company was able to keep its standards resources engaged for long drawn out period. Further, due to its name brand, the company was able to influence other external parties during standards creation involvement. As one respondent highlighted how the company used its influence to woo the silicon vendors:

> *"...the whole silicon vendor angle is more important than just building the building block numbers but really somehow demonstrate some long term economic feasibility kind of statement that we could drag the price low, and once our IPR is in the silicon, that is a strong statement to make."*

Another respondent noted the following in the context of customers and startups:

> *"...when you are a bigger company, that plays a major role because when you are a big company the operating companies say that well this guy is a big guy let us not fight with them. After all we are going to be their customers what they do is good for us. The smaller companies or the startups don't try to just harm you too much because startups are looking for a buyer. That's the ultimate goal of a startup so they are going to be very cautious and they try to work with you off-line to come up for a compromise.."*

Further, due to its influence over other external parties, the company was able to build alliances and therefore invest lesser in terms of its own standards resources without compromising the desired outcomes of its standards creation involvement.

5.3.5 Market Optimism

Three cases indicated that market euphoria and optimism at the start of standards creation involvement had been instrumental in determining the success of standards creation. It was mentioned that the willingness to undertake new standards creation activities was higher due to the overall optimism in the industry. However, the specific measures or metrics to determine the market euphoria and optimism were not explicitly identified.

The same market optimism was also contributed to the creation of an overall market for the associated technology due to the willingness among the industry parties to invest into newer technologies.

5.3.6 Mediating Group's Presence

Three cases emphasized that influence of a mediating group's presence on the outcome of standards creation involvement. The respondents indicated that the presence of a mediating group, which had a mandate from executives to bring pertinent parties to an agreement and was not specifically tied to a single product development group, was instrumental in the success of standards creation involvement and the overall technological and business success of the company. This circumstance was identified in addition to the pertinent parties' interest, identified in section 5.2.3 as another circumstance. One respondent commented on the constraints encountered by standards resources in absence of a mediating group responsible for maintaining the bigger picture:

> *"...where they're going to be so busy dealing with the fire around them, the alligators, mixing metaphors here, so busy dealing with the alligators who are trying to chew their backsides that it's going to be almost impossible for them to step back and deal with the larger project that they are actually trying to do."*

While another respondent pointed out specifically on the significance of such a group that had been present within the company:

> *"...Another key thing that I would like to say is that we had <snipped> that was a key role in moderating between the standards groups the product groups and business groups..."*

5.3.7 Internal Funding Environment

Two cases highlighted that the internal funding environment had facilitated the success in standards creation involvement. This was particularly significant since the executives could afford to commit resources for a new technology even without rigorous risk analysis and due diligence.

This company-level funding environment is assumed to be associated with the industry-level market optimism, as mentioned in section 5.25, though this relationship was not established by the data.

5.3.8 Executive Support

Two cases indicated that executive support contributed to the success of the company's standards creation involvement. The executives had demonstrated an appreciation for the significance of standards creation involvement and supported it. Executive support seemed to have played a role in pertinent parties' interest, as described in section 5.2.3. Executive support also enabled the company to engage its customers and even its competitors.

5.3.9 Industry Stability

Two cases specifically pointed to the role that a relatively small and stable industry has played in determining the success of standards creation involvement. It was mentioned that in a stable industry, the number of industry players were limited and each player was clear on its role and focus. Even the number of different standards definition organizations (SDOs) staking a claim on the associated technology was limited. Industry stability led to a more predictable industry and each player was able to make a deterministic move with higher confidence in its ability to predict others' moves.

A relatively less number of players ensured that alternate proposals for standards were limited and negotiation process to reach consensus on a common approach was relatively simpler. Current day industry with more number of players was cited to be resulting in lot of overlaps and contentions during standards creation. In the words of one of the respondents:

> *"...I think there were clear ownership of standards at that time, there were clear ownership of the companies and what businesses they were in and there were clear understanding of what our business was. Some external too, the standards bodies were clear as what their role was. <snipped> And the service providers' owners were clear what their roles were as well..."*

5.4 Success Measures

Data analysis identified seven significant *success measures* for standards creation involvement. Some of these *success measures* were not necessarily targeted by the company at the start of its standards creation involvement, however, these were found to be desirable and beneficial after the completion of the involvement. While all seven *success measures* were desirable outcomes for the company, two *success measures* were also found to be desirable for the industry in general. *Success measures* which benefited

the company are termed as company-level *success measures*, while *success measures* which benefited the industry are termed as industry-level *success measures*. Table 2 provides a summary of these *success measures*.

Table 2: Success Measures

Symbol	Success Measure	Company-level?	Industry-level?
SM1	Standards Specification	Yes	Yes
SM2	Leadership & External Credibility	Yes	
SM3	Creation of Ecosystem/Market	Yes	Yes
SM4	Vindication of Development/research	Yes	
SM5	Market Share for Company	Yes	
SM6	Learning & Experience Gained	Yes	
SM7	Return on Std. Resource Investment	Yes	

5.4.1 Standards Specification

All the cases identified a good standards specification as a measure of success for both the company and industry. Determination of a good standards specification for the company was based on number of company's key positions that eventually were agreed and embedded in the specification. A good standards specification contributed to marketing and business success since it allowed the company to undergo minimal changes in its product implementations and provided credibility to its ability to contribute to a good standards specification.

Determination of a success standards creation for the industry was based on correctness and completeness of the specification. A complete and correct standards specification was seen to facilitate wider acceptance of the involved technology among the vendors and customers. These views were well expressed by one participant who mentioned:

> *"...this was a success because we got a good solid standard, well thought out well written, without a good solid standard to base it on, I do not think this would have been anywhere near the marketing or business success that it was. In other words a good set of standards like <snipped> was a cornerstone for the business success."*

5.4.2 Leadership & External Credibility

Five cases highlighted leadership and external credibility that the company established through its standards creation involvement as company-level *success measure*. It was mentioned that due to company's standards creation involvements, many external participants took note of the company. This helped the company to gain mindshare as a leader in the associated technologies. Further, the company's external credibility had helped in some of its future standards creation activities. In fact, the benefits of leadership and external credibility established through standards creation involvement extended beyond the standards creation. As one respondent mentioned:

> *"...quite frankly as a consumer, when I buy a TV set, I suspect that Sony or JVC may be better than Memorex TV, whatever, why, not because I read the technical specification, but just because the name brand, they seem to know what they are talking about, so you see that there may be some physiological things playing there as well, anyways, I really think that visibility thing is important though."*

Another respondent observed:

> *"...there always was a very strong element of being visible to the customer and potential customers and demonstrating the expertise, demonstrating commitment, demonstrating the ability to deliver and develop conforming products."*

5.4.3 Creation of Ecosystem/Market

Three cases identified creation of a market and overall ecosystem for the related technology as both company-level and industry-level *success measure*. This measure was significant when the company was able to play a key role within this ecosystem/market.

Since the success of a *telecom* technology could not be ensured by a single company, it was pointed out that interest and support from different parties, e.g. system vendors, customers, chip vendors, integrators, etc. was required to ensure the success of a *telecom* technology. As a result, the amount of interest created in the industry was seen as a measure of success for the company in promoting its technology via standards creation involvement.

For the industry, different parties' involvement ensured viability and commercial success of the telecom technology involved. In words of one of the respondents:

> *"...that's really the key to see if the standard was successful, i.e. did the pie increase as a result of the standard, did the standard feed into the ecosystem, the system vendors' and service providers' use..."*

5.4.4 Vindication of Development/Research Effort

Three cases identified vindication of development and/or research effort as company-level *success measure*. For a new telecom technology, the research and pre-standards implementations reflected the company's belief in technical and business directions. Successful completion of standards creation involvement, which included the standard embracing proposed technology, provided confidence to the company in its own technical and business strengths.

In some cases, standards creation involvement was specifically used to validate research thinking and early implementations. One of the respondents noted:

> *"...that alone indicated success in that it validated that we, this group, was going down a path, a <snipped> path, however big or small, a <snipped> path, that we could defend publicly within industry and that was accepted within the industry."*

However, it was also pointed out by some respondents that the decision for standards creation involvement and timing of such involvement must be complemented by a complementary business plan. This indicated that though standards creation involvement could prove to be a useful exercise to validate company's interest in a technology and its implementation, it still needed to be complemented with a business plan. This is further described in section 6.

5.4.5 Market Share for Company

Two cases identified the market share, which the company was able to eventually claim, as company-level *success measure*. This was related to the *success measure* mentioned in section 5.3.3 since having built a "pie" the company was able to claim a significant "piece of the pie".

5.4.6 Learning & Experience Gained

Two cases emphasized the learning and experience gained as part of standards creation involvement to be a critical *success factor* for its following standards creation activities. Therefore, learning and experience gained during standards creation involvement was described as company-level *success measure*. In one respondent's words:

> *"When we look backwards, understand key critical success factors which were in <snipped> and write it down as a recipe for dinner how you cook a meal like that and we followed exactly the same formula."*

5.4.7 Return on Standards Resource Investment

Two cases emphasized return on standards resources investment, resulting from standards resource effectiveness, as company-level *success measure*. It was noted that in

some cases, though the number of standards resources engaged in standards creation was less than the number of its competitor's resources, these resources were able to achieve the desired standards outcomes. As one respondent pointed out:

> *"...the resources we threw at the working group, relatively speaking was light, and given the resources we threw at the standard and the result, that to me is another indication of success..."*

A similar anecdote was offered by another respondent:

> *"... had relatively fewer resources allocated than many others, there were meetings for example there was one case I remember, there was I by myself facing no less than 13 from <snipped> trying to argue a point and in the end we (I) prevailed with a little help from the operator side."*

5.5 Success Factors

The data analysis also identified nine *success factors* which were specific *actions* by the company during its standards creation involvement and which were found to contribute to the success of these involvements. Company's *actions* that were not visible outside the company were termed as company-level *success factors*, while *actions* which were visible outside were termed as industry-level *success factors*. Table 3 provides a summary of these *success factors*.

Table 3: Success Factors

Symbol	Success factors	Company-level?	Industry-level?
SF1	Internal Coordination	Yes	
SF2	Alliances Focus		Yes
SF3	Perseverance	Yes	
SF4	Compromises	Yes	Yes
SF5	Prototyping	Yes	
SF6	Resource Selection	Yes	
SF7	Cross SDO/Forum Coordination		Yes
SF8	New SDO/Forum Creation		Yes
SF9	Aggressiveness		Yes

5.5.1 Internal Coordination

Five cases indicated that efforts made internally to facilitate coordination among pertinent parties and agreement on common features and internal specifications helped to achieve consistent positions during standards creation involvement. This eventually led to a successful standards creation involvement. Specific efforts were made to get agreement across different product groups, which were interested in the related technology. Besides the product groups, other internal pertinent parties were engaged, which included designers, architects, marketing, and standards folks, as mentioned in section 5.2.3.

One respondent anecdotally added:

> *"...it's all about teamwork really; you know the team is not just made up of the quarterback but also the linesmen and the receiver and the kicker and everybody else..."*

Where pertinent parties were already interested, subsequent coordination efforts were easier. Similarly, presence of mediating groups, as per section 5.2.6, and executive support, as per section 5.2.8, had facilitated internal coordination efforts.

5.5.2 Alliances Focus

Four cases highlighted that efforts towards building industry-level alliances contributed to successful standards creation involvements. Alliances were created to complement the company's limited standards resources and/or to strengthen company's standards positions. Alliances were also created to counter entrenched competitors in specific standards bodies. One respondent noticed:

> *"...given that we did not have enough troops, our strategy was to form alliances; that is what we did."*

Alliances helped to create standards embedded with company's positions. Alliances also allowed the company to play a "good citizen" role during standards creation due to its efforts to coordinate and bring together external parties. This helped to establish its leadership and visibility during standards creation involvement. This also helped in building an external ecosystem/market.

5.5.3 Perseverance

Four cases identified that the company's perseverance during its standards creation involvements was instrumental in wearing down the competitors leading to successful standards creation involvements. In some cases, the competitors were forced to retreat from their positions as they were unable to maintain their investment into standards creation activity.

It was noted that the perseverance and longevity of continued standards creation involvement were possible for the company since it was large and had relatively more resources at its disposal. Furthermore, internal funding environment and support from executives was found to be instrumental in sustaining the standards creation involvement.

Consequently, company's perseverance was found to have paid off in most cases as the company was able to create standards with most of its positions embedded in it. Further, the company was able to establish leadership and build credibility by being able to last to the end in a long drawn out standards creation activity.

5.5.4 Compromises

Four cases emphasized the significance of negotiations and compromises made by the company during its standards creation involvements. Compromises were most noticeable when significant competitors had been involved in the standards creation. Compromises were mentioned as being part of the ecosystem building process since compromises allowed each significant party to get some of its positions embedded into the standards. At times, compromises, even though undesirable, had been the only way out of a standoff, when significant competitors were involved. One respondent noted:

> *"...it was sort of making a deal with the devil."*

The cases highlighted that there had been some of company's initial positions put forwards at the start of standards creation involvement were bound to experience some changes. Further, it was noted that the company had given up its intellectual property rights (IPR) in the interest of building an ecosystem and a market for the associated technology. However, the company had been confident about its technological strengths to compete with others in this new market. One respondent mentioned:

> *"...we agreed to give it (IPR) away so that we could get market return on it, not protection return..."*

While another respondent noted that:

> *"...patents were only protection ... weren't considered as revenue generating ... we were in a position where we rather make the solutions set broader, have more people compete with the same solution."*

Some factors which allowed the company to make compromises were interest from internal pertinent parties and presence of an internal mediating group. These helped the standards participants to be clear on the company's critical positions. The standards participants could fight hard to get the critical positions embedded in the standards specification, while non-critical positions could be given up as part of compromises.

Specific outcomes of negotiations and compromises were that the company could guarantee some of its key positions to be embedded in the standard. Further it demonstrated leadership and build credibility as a player that others could work with.

5.5.5 Prototyping

Four cases emphasized that prototyping experience gained as part of incubation stage of the standards creation was significant for the success of standards creation involvement. Prototyping experience was found to be instrumental in establishing clarity on the specific aspects of the associated technology without committing resources for product development. Prototyping experience also served to convince pertinent parties about the viability and feasibility of the technology during the incubation stage of standards creation. As pointed out by one respondent:

> *"...there was a lot of skepticism initially inside <snipped> that this would be a good thing to do, and prototype helped to eliminate that idea."*

Prototyping was also instrumental in influencing the external customers and/or allies to convince that the company knew what it was talking about. In cases when the competitors forced the company into standards creation involvement, prototyping

provided the company an ability to push back specific competitor proposals that were not favorable to the company's own implementation experience. Prototyping allowed continuing technology evolution. Another respondent provided an anecdotal observation:

> *"Let the potential customers kick the tires of a thing that is not ready that is why you see automakers bring the concepts of the cars to trade auto shows, its just to show what could be done and it is not a drawing on a piece of paper but we actually took the time to bend some metal and make the thing look like it quite, what it looks like in the real world. Helps an awful lot to convince people and sway opinions and with that it is perhaps easier to convince would be future competitors to work with you to build the ecosystem..."*

Some factors which allowed the company to invest into prototyping activities included support from executives and internal funding environment. Prototyping helped the company to vindicate its technological direction. Prototyping experience also helped the company to identify key issues in advance before committing product investment.

5.5.6 Resource Selection

Three cases highlighted that the company has decided to dedicate strong technical resources for standards creation involvement which resulted in the eventual success. This helped the company to establish its leadership and get a standards specification with its preferred positions embedded in it. One respondent pointed out:

> *"...they had their leadership there but what we did was that we would be very very active in the technical aspects of the work and that played a major role so in the <snipped> I do not believe the leadership played a major role but the technical activities that we had that we were present in every group."*

Another respondent expressed similar opinion:

> *"Don't underestimate the strategic marketing value of standards involvement and the strategic marketing value is not simply presence in the standards meeting of a couple of a delegates but it's really more than anything else of how much influence you exert through contributions and through your ability to be a active participant in a technical discussion and to be actively influencing the way things turn out..."*

Interpersonal skills of the standards resources were cited as another important aspect which helped the company to build alliances. Some respondents mentioned that a balance between the technical and political skills of standards participants was responsible for company's success in standards involvement. Skilled resources effected key positions into standards specifications. Skilled resources convinced the customers and other external participants about the company's leadership and credibility and also forced these participants to take note of the company's positions. Skilled resources also resulted in maximizing the return on standards resource investment.

5.5.7 Cross SDO/Forum Coordination

Two cases identified that the company's initiatives to invest into liaison activities to keep different standards bodies aligned were instrumental in the success of the associated standards creation involvement. As mentioned in section 5.2.9, industry stability was found to facilitate successful standards creation. However, when the industry was not stable, different standards bodies were known to have an overlap. Some competitors were found to have taken advantage of this situation to reintroduce those proposals that had been rejected or pushed back in other standards bodies. Coordination initiatives helped the company to keep different standards bodies aligned and prevent competition from sneaking their proposals.

It was noted that the company could offer its resources for liaisons since as a large company it could afford this overhead. Efforts of an internal group were cited to be instrumental in identifying overlap across different standards bodies. The liaison initiatives proved to be instrumental in creating a single public standards specification for

the associated technology. These liaisons also helped to establish company's leadership in the industry.

5.5.8 New SDO/Forum Creation

Two cases pointed out that the company had been involved in creating a new standards body as part of its standards creation involvement. When encountered with hostile environment in existing standards bodies, the company and its allies, eventually agreed to launch a new standards body. However, it was also pointed out that in general the preference of the company had been to work within the existing standards bodies since creation of a new standards body was a significant overhead.

It was highlighted the company was able to involve itself in the creation of a new standards body since it was able to afford this additional investment. The overall market optimism contributed in the industry being receptive to the formation of a new standards body. Creation of a new standards body also helped the company to establish its leadership and credibility.

5.5.9 Aggressiveness

Data analysis also highlighted that the aggressiveness adopted by the company during its standards creation involvements helped the company in being successful. The aggressive approach, adopted particular during those standards creations that has been initiated by the company's competitors, had been a departure from its typical rationale approach. This allowed the company to gain visibility and become a player in the standards creation. It also allowed the company to contain the competitor from running away with its positions and keeping the scope of standards limited to what the company

could handle. However, the aggressiveness was not quantified and no specific attributes could be concluded. One respondent point out:

> *"...since people tend to respect those who are heard, people who do not know what's going on which is sometimes a large portion of the audience, if you say something they think that you know something and that may come in handy..."*

Aggressiveness was attributed to the company's size and the support from its executives. Aggressiveness allowed the company to get a standard specification embedded with its positions. Aggressiveness also helped to increase company's visibility.

6 EMERGENT THEORY

The focus of this research has been the *success measure* and *success factors* for standards creation involvement in a large telecom product development company. Section 5 further identified *circumstances* that influenced the outcomes of the standards creation involvement. This section presents a summary of emergent insights with a compilation of findings in section 5. It also reflects researcher's own four years experience in standards creation and proposes evaluation criteria for standards managers to predict the likelihood of success and potential issues with any standards creation involvement requirements before resources are dedicated for such involvement.

6.1 Success Factors and Success Measures Relationship

6.1.1 Company-level Coordination Aspects

Data analysis identified company-level coordination (section 5.5.1) and resource selection (section 5.5.6) as company-level *success factors*. Also, ability to make compromises (section 5.5.4) was found to be an industry-level *success factor*. It was observed that these factors contributed towards some *success measures* used to declare the associated standards creation involvement as being successful.

In the large telecom product development company, it was found that often different product groups were interested in the same technology; however, each product group generally maintained its own resources e.g. pertinent parties including designers, architects, marketing and standard folks, as mentioned in section 5.3.3. However, to maximize likelihood of success with embedding preferred positions into standards specification (section 5.4.1) and maximizing return on standards resources investments

(section 5.4.7), it was found that consistent messaging was necessary during standards creation involvement. Consistent positions were possible only by ensuring close company-level coordination among different groups especially during the public standards creation activity phase of the lifecycle, as shown in Figure 7.

This coordination was also required to determine the critical positions that the company needed to defend during the standards creation while it could afford to show some flexibility on other positions that were not critical for the company. The non-critical positions could be given up as part of compromises. Compromises ensured that the company could guarantee some of its key positions to be embedded in the standards specification while it also demonstrated flexibility during standards creation involvement which allowed it to also build some industry credibility.

Such coordination aspects were found to be facilitated by *circumstances* like pertinent parties' interest (section 5.3.3), mediating group's presence (section 5.3.6) and executive support (section 5.3.8). It was noticed that just the desire to have coordination was not sufficient unless the above circumstances were present. Where pertinent parties were already interested, subsequent coordination efforts were easier. Similarly, presence of mediating group and executive support facilitated internal coordination efforts by mandating such coordination in many cases. Such coordination at company-level almost helped to build an internal ecosystem.

Similarly, the advantage of dedicating strong technical resources with political flair was established in section 5.5.6. However, such resources were not common across all interested groups and therefore required mediation and support from the executives to dedicate for the standards creation involvement. Besides influencing key positions into

standards specifications and helping to establish the company's leadership and credibility by forcing external participants to take note, skilled standards resources allowed the company to focus on such resources that were able to represent the interest of different groups rather than each group dedicating their own resources.

Figure 8 highlights some of the observed relationships among various *circumstances*, *success measures* and *success factors* that were significant in company-level coordination aspects.

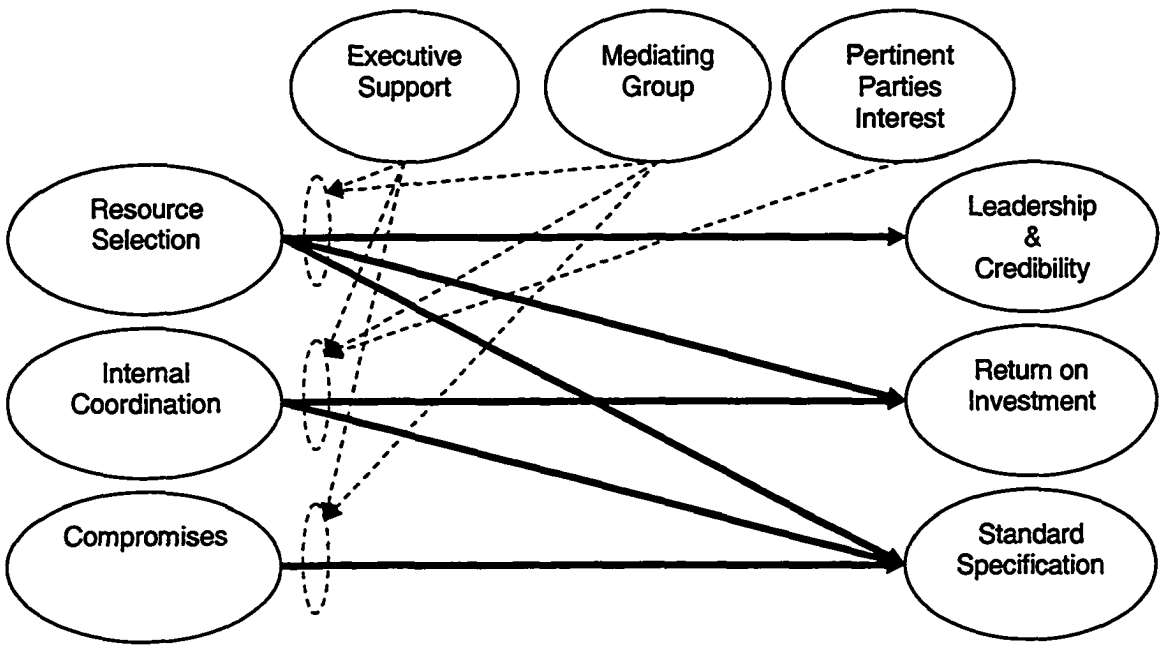

Figure 8: Company-level Coordination Aspects

[H1a1] Coordination efforts among internal groups of a large telecom product development company during public standards creation activity contribute towards a standards specification consistent with company's preferred positions.

[H1a2] Coordination efforts among internal groups of a large telecom product development company during public standards creation activity contribute towards maximizing return on its standard resources investment.

[H1a3] Skilled standard resources with technical expertise and political flair dedicated for public standards creation activity contribute towards a standards specification consistent with company's preferred positions.

[H1a4] Skilled standard resources with technical expertise and political flair dedicated for public standards creation activity contribute towards a establishing their company's leadership and external credibility.

[H1a5] Skilled standard resources with technical expertise and political flair dedicated for public standards creation activity contribute towards maximizing return on their company's standard resources investment.

[H1a6] Compromises made during public standards creation activity by a large telecom product development company towards a standards specification consistent with some of company's key positions.

[H1b1] Pertinent parties' interest in a large telecom product development company facilitates coordination among internal groups during public standards creation activity.

[H1b2] Presence of a mediating group in a large telecom product development company facilitates coordination among internal groups during public standards creation activity.

[H1b3] Executive support for standards creation involvements in a large telecom product development company facilitates coordination among internal groups during public standards creation activity.

[H1b4] Presence of a mediating group in a large telecom product development company facilitates selection of skilled standards resources with technical expertise and political flair.

[H1b5] Executive support for standards creation involvements in a large telecom product development company facilitates selection of skilled standards resources with technical expertise and political flair.

[H1b6] Presence of a mediating group in a large telecom product development company facilitates compromises made during standards creation involvements.

Further, the internal coordination aspects and the importance of mediating group suggest that a hybrid model of managing standards is more applicable rather than a purely centralized or de-centralized model. Such a hybrid model would have standard resources within each group that can coordinate with other pertinent parties with the product groups

e.g. designers, architects, marketing personnel. Subsequently, these standard resources can work with a centralized group (i.e. the mediating group as in section 5.3.6) which is responsible for maintaining consistency across different groups. Another role that such a centralized group can play is to provide long-term commitment for standards resources given that standards creation can be a long term involvement, as mentioned in section 5.2, while individual product groups may have shorter lifecycles and even shorter focus on individual standards creation activities.

[H1c1] A hybrid standards management model in a large telecom product development company contributes towards successful standards creation involvements where the hybrid standards management model is a combination of centralized standards resources and decentralized standard resources working within each product group.

6.1.2 Industry-level Engagement Aspects

Data analysis identified alliances focus (section 5.5.2), cross SDO coordination (section 5.5.7) and new SDO creation (section 5.5.8) as industry-level *success factors*. It was observed that these factors contributed towards successful standards creation involvement.

Alliances were created during the incubation stage of standards creation lifecycle to validate the development and research efforts (section 5.4.4). Later on, during the public standards creation activity, alliances were emphasized to complement company's own standards resources and/or to strengthen company's standards positions. During the public standards creation stage, alliances helped to maximize the return on standards investments (section 5.4.7). By allowing the company to counter its competitor's entrenched positions, alliances also helped in creating standards embedded with mutually agreed positions (section 5.4.1). By facilitating creation and coordination of alliances, the company also established its leadership and external credibility (section 5.4.2) during

standards creation involvement. Finally, alliances benefited the industry by facilitating an external ecosystem/market (section 5.4.3).

Ability of the company to create alliances was influenced by vendors' interest (section 5.3.1), customers' interest (section 5.3.2), and the company's size and brand name (section 5.3.4). The reason some of the vendors and/or customers agreed for form alliances was since these vendors/customers were at least interested in the technology. Similarly, the name and size of the company facilitated the alliances since vendors and/or customers could feel comfortable working with a company that had been around for some time and had the reputation and ability to influence the outcomes during standards creation involvements.

Industry stability (section 5.3.9) played an enabling role in successful standards creation activities. However, during industry's instability, it was not uncommon to see many standard definition organizations (SDOs) to stake a claim on same technology, thereby leading to overlaps. Some competitors attempted to take advantage of such instability and attempted to pitch SDOs against other SDOs where they lacked sufficient influence. Cross SDO coordination initiatives like liaison officers helped the company to keep different SDOs aligned. Such coordination was instrumental in creating non-competing standards which facilitated the usefulness of those standards. The company could also establish its leadership and external credibility by offering to keep the activities coordinated among different SDOs.

The company could offer some of its resources as liaisons officers due to its size and its ability to maintain more standards resources. Some company-level circumstances,

e.g. executive support (section 5.3.8) and internal funding environment (section 5.3.7) also allowed the company to focus on cross SDO coordination activities.

On the contrary, when the company and its allies found themselves faced with hostile environment in existing SDOs, the company and its allies eventually agreed to launch a new SDO with the company playing a major role in its creation. The creation of a new SDO allowed the company and its allies to get standards specification consistent with their preferred positions (section 5.4.1). Creation of a new SDO also helped the company to establish its leadership and external credibility (section 5.4.2). A new SDO also helped in building a new ecosystem/market (section 5.4.3). The company positioned itself to get a significant share from the newly created market (section 5.4.5).

Company's size (section 5.3.4), vendors' interest (section 5.3.1), customers' interest (section 5.3.2), and market optimism (section 5.3.5) facilitated the company involvement in creation of a new SDO, though creation of a new SDO was realized to be a significant overhead and was not a common event.

Figure 9 highlights some of the observed relationships among various *circumstances*, *success measures* and *success factors* that were significant in industry-level engagement aspects.

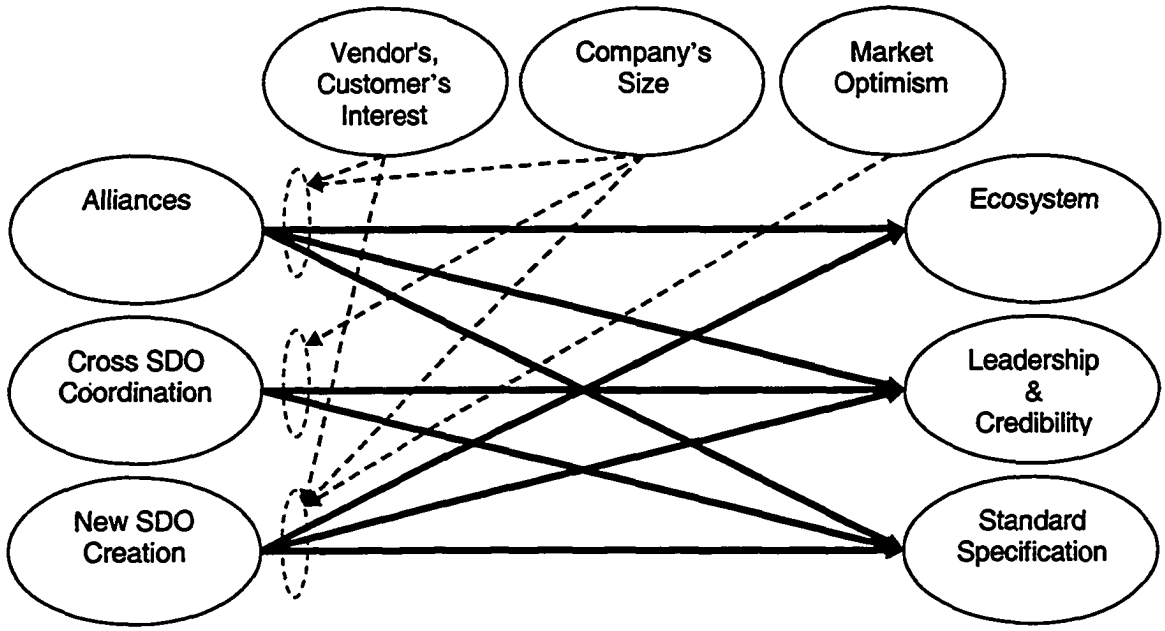

Figure 9: Industry-level Engagement Aspects

[H2a1] Alliances of a large telecom product development company with other industry players during public standards creation activity contribute towards a standard specification consistent with company's preferred positions.

[H2a2] Alliances of a large telecom product development company with other industry players during public standards creation activity contribute towards establishing its leadership and external credibility.

[H2a3] Alliances of a large telecom product development company with other industry players during public standards creation activity contribute towards building an ecosystem for a new market opportunity.

[H2a4] Cross SDO coordination by a large telecom product development company during similar standards creation activities among multiple SDOs contributes towards a standard specification consistent with the company's preferred positions.

[H2a5] Cross SDO coordination by a large telecom product development company during similar standards creation activities among multiple SDOs contributes towards establishing its leadership and external credibility.

[H2a6] Creation of a new SDO by a large telecom product development company and its allies when encountered with hostile conditions in existing SDOs contributes towards a standard specification consistent with company's preferred positions.

[H2a7] Creation of a new SDO by a large telecom product development company and its allies when encountered with hostile conditions in existing SDOs contributes towards establishing company's leadership and external credibility.

[H2a8] Creation of a new SDO by a large telecom product development company and its allies when encountered with hostile conditions in existing SDOs contributes towards building an ecosystem for a new market opportunity.

[H2b1] Vendors' and/or customer's interest in a new technology facilitates formation of alliances with other partners interested in the same technology during incubation stage of standards creation.

[H2b2] Vendors' and/or customer's interest in a new technology facilitates formation of a new SDO when those parties are encountered with hostile conditions in existing SDOs.

[H2b3] A large telecom product development company's size and brand name facilitates formation alliances with other vendors and/or customers.

[H2b4] A large telecom product development company's size and brand name facilitates its cross SDO coordination efforts during similar standards creation activities among multiple SDOs.

[H2b5] A large telecom product development company's size and brand name facilitates formation of a new SDO when the company and its allies are encountered with hostile conditions in existing SDOs.

[H2b6] Market optimism facilitates formation of a new SDO when the company and its allies are encountered with hostile conditions in existing SDOs.

6.2 Evaluation Criteria for Standards Creation Involvement

This section proposes criteria for standards practitioners to evaluate a standards creation requirement before embarking on associated standards creation activity. The proposed criteria are expected to help the standards practitioners to predict probability of success and determine potential issues with a standards creation involvement. It is recommended that standards practitioners in a large telecom product development company use these criteria as prerequisites for their standards creation involvement.

6.2.1 Complementary Business Plan

It was mentioned by most respondents that a strong standards creation strategy needed to be backed by a strong business strategy. It was recommended that a standard be seen as a tool rather than a necessary evil, as indicated in one respondent's comment:

> *"...where that business strategy is <to> use the standards to support the ecosystem, use the standards to help with the marketing of your product, and of course have the product ready in time when the standard is there..."*

Presence of an overall business plan was assumed to be reflected in company-level coordination efforts, when mandated among internal groups, and a mediating group's efforts as expressed section 5.5.1 and 5.3.6.

It is proposed by the researcher that unless a company is in a position to complement its standards creation involvement with a complementary business plan, it should not initiate a standards creation activity. Similarly, if the standards creation activity is initiated by its competitors, the company should make attempts to discourage it or slow it down such that it can eventually catch up. If standards creation involvement is not tied to a company's business plan, its competitors with complementary business plan can reap benefits.

[Evaluation Criterion 1] Unless there is complementary business plan and strategy, the decision to initiate/support a standards creation activity and commitment of standards resources should not be rushed.

6.2.2 Prototyping

Most of the cases were introduced into the standards bodies after some initial prototyping experience and/or product experience. As pointed out in section 5.5.5, this experience had been a significant *success factor*. For a product development company,

prototyping and/or pre-standards product experience seems essential to predict a successful standards creation involvement.

Standards practitioners should use prototyping and/or similar experience as a criterion to determine if a standards creation involvement should be undertaken or not. It is observed that if such experience is not available, the positions put forward by the company in standards creation will be unclear and lead to a standard with unclear positions.

[Evaluation Criterion 2] Unless there is prototyping and/or pre-standards product implementation experience, the decision to initiate/support a standards creation activity and commitment of standards resources should not be rushed.

6.2.3 Development Teams' Engagement

Another aspect of standards creation involvement which was repeatedly cited as a significant *success factor* was a close relationship of standards participants with designers and architects, as mentioned in section 5.3.3. This resulted in faster turn around on establishing company's positions and determining issues with its competitors' positions.

Since the development teams encounter implementation specific issues during their development activities, their participation is critical in standards creation involvement. It is observed that standards practitioners should demand the involvement of development teams (including designers and/or architects) before committing to a standards creation involvement.

[Evaluation Criterion 3] Unless close and continued coordination between the standards participants and product development teams (e.g. designers and/or architects) is mandated, the decision to initiate/support a standards creation activity and commitment of standard resources should not be rushed.

6.2.4 Mediating Group's Involvement

For a large product development company, presence of a mediating group is almost a requirement to ensure alignment and consistency of technological positioning across different product groups, as pointed out in section 5.3.6. It helps to maintain a consistent messaging in marketing and standards activities. It is particularly important when more than one group is interested in the technology inside the company or when competing technologies are being pursued within the company.

It is observed that standards practitioners should demand the presence of a mediating group especially when a standards creation involvement spans across more than one product group inside the company.

[Evaluation Criterion 4] When more that one product group is interested in a technology associated with standards creation involvement or when competing technologies are being pursued in a large product development company, the decision to initiate/support a standards creation activity and commitment of standards resources should not be rushed unless a mediating group is present and empowered to broker consistent positioning of the associated technology.

6.2.5 Long-term Commitment

A typical lifetime of a standards creation involvement ranged from six to eight years, as highlighted in section 5.2. This required a long-term commitment both in terms of standards resources and internal involvement of pertinent groups. It was also noticed that during the first half of this period, technical experts with political flair were necessary. The long-term commitment for a drawn out standards creation was also necessary to provide continuity to the standards resources since standards resources could not be simply "parachuted" into a standards creation involvement.

It was also observed that the standards creation involvement generally spanned a longer duration compared to a typical product group's interest. This highlighted the need

to have a centralized standards group which could work with different product groups, especially in a large product development company. A centralized standards group could continue to be involved in the standards creation activity and could provide continuity, even when a single product group either loses interest or can no longer afford continued standards involvement.

[**Evaluation Criterion 5**] Unless standards participants can be committed for the entire duration of a standards creation involvement, which itself can be a long drawn out process, the decision to initiate/support a standards creation involvement and commitment of standards resources should not be rushed.

6.2.6 Standards Resource Skill Set

It was observed that the most effective standards resources that led to successful standards creation involvement were strong technical participants. The role of strong political leaders in standards creation was not specifically called out by the respondents. It was mentioned that the customers were known to pay close attention to vendors who brought technical contributions and were able to engage in technical discussions and contribute to the standards specification. Standards creation was therefore identified as an excellent marketing opportunity by these respondents.

Standards practitioners should therefore look to dedicate strong technical experts for standards creation activities. It was indicated that the standards participants needed to maintain a bigger picture besides specific technology positions. Specific need for strong political leaders in the standards groups was not identified for successful standards creation involvement. It is assumed that political leaders may play a role in defensive standards activities which may include defending against modifications and/or deprecation of past standards supported by the company.

[Evaluation Criterion 6] Unless technical experts with political flair, preferably with visibility to a company's overall technological initiatives, can be committed to a standards creation involvement, the decision to initiate/support a standards creation activity and commitment of standards resources should not be rushed.

6.2.7 Competitive Information

As per section 5.3.1 and 5.3.2, it was indicated that competitors' and customers' interest had been instrumental in the success of the standards creation involvement. Market awareness and competitive information serve as useful inputs to determine whether a standards creation activity is likely to have an uptake in the industry and also serve to validate company's own interest in technology.

Standards practitioners should therefore look for competitive information and market research to determine potential uptake of the technology related to the standards creation involvement before launching the standards creation activity.

[Evaluation Criterion 7] Unless competitive information substantiates competitor and/or customer interest in associated technology, the decision to initiate/support a standards creation activity and commitment of standards resources should not be rushed.

6.3 Standards Creation Involvement Recommendations

This section makes recommendations for two specific *success measures* for standards creation involvement in a large telecom product development company. These *success measures* were already introduced in section 5.2.1. However, the researcher observed that these two *success measures* were not initially targeted by the standards practitioners. These measures were highlighted by some of the case study respondents only after completion of the associated standards creation involvements. These *success measures* were found to be significant, specifically in context of a large product development company that was continually involved in standards creation activities.

6.3.1 Significance of Ecosystem Building

As indicated in section 5.4.3, an ecosystem is essential for the overall success and uptake of a technology related to standards creation involvement. Therefore a significant measure of the success for a standards creation activity is the extent to which an ecosystem is build before and after the initiation of standards creation involvement.

A large product development company should not try to use its intellectual property for the purposes of protection revenue, rather it should be prepared to give away its intellectual property at reasonable and non-discriminatory terms in order to build an ecosystem and market segment where it can compete based on its strengths.

[Recommendation 1] A large product development company should target to create a pie and further target a significant portion of the pie. This generally requires giving away its IPR at reasonable terms and conditions.

6.3.2 Significance of Institutionalizing Learning

Since significant investment is made for a long-term basis, and since significant learning and experience is gained during standards creation involvement, as also pointed out in section 5.4.6, a large product development company should try to institutionalize the learning as part of its standards creation involvement. This learning is expected to help in future standards creation activities which a large product development company is likely to engage in.

Standards practitioners in a large product development company should focus on institutionalizing the learning in standards creation involvement and should apply the learning from past standards creation involvements to future ones.

[Recommendation 2] A large product development company should target to institutionalize learning and experience gained from its standards creation activities.

7 CONCLUSION, LIMITATIONS & FURTHER RESEARCH

7.1 Conclusion

The study proposes seven *success measures*, nine *success factors*, and nine *circumstances* for standards creation involvement in a large telecom product development company. In contrast to the researcher's initial expectation, the *circumstances* were found to mediate the effect of *success factors* on *success measures* rather than directly influencing the *success measures*. This relationship among various *success factors*, *success measures* and *circumstances* was highlighted in Figures 8 and 9.

Section 6.1.1 and 6.1.2 propose testable hypotheses which related to *success measures*, *success factors*, and *circumstances* for standards creation involvement in a large telecom product development company. Section 6.2 proposes evaluation criteria for standards practitioners in a large product development company to predict probability of success and determine potential issues with a standards creation activity before embarking upon it. It also equips standards participants and leaders with guidelines to emulate success in standards creation activities of the past. In section 5.2, the researcher also proposes a typical telecom standards creation lifecycle.

The researcher plans to apply the emergent theory to data from thirteen on-going standards creation projects which were surveyed during the preliminary work, as described in section 4.2. The intent of applying the emergent theory is to make specific recommendations of *actions* that will increase the probability of success. These specific recommendations are outside the scope of the thesis work and are therefore not included here.

7.2 Limitation

This research was designed to be centered on a single large telecom product development company. The study is limited to respondent accounts and recollection of standards creation activities that they had been involved in the past. However, archival data collected from the public domain on the selected cases, as described in section 4.3, was found to be consistent with the respondent accounts. Even though the public domain archival data reflected on limited aspects of the standards creation projects, the consistency of this information with the respondent accounts helped to provide validity to the information collected during the multiple cases study.

Though the cases selected for the study provided significant insights, the selected cases could have been explored further by taking into consideration multiple perspectives of different parities involved during the standards creation. However, some targeted respondents, representing other stakeholder groups than those selected, were no longer available with the company and therefore were not accessible for this study.

7.3 Further Research

The emergent grounded theory proposed in this research in section 6.1 can be tested via a positive method in further research.

The research and its findings can be expanded by looking at the data from other companies, including large and small telecom product development companies. A similar expansion can be made by accounting for standards creation activities in other fields e.g. manufacturing, service industries, etc.

Another extension of this research can be made by focusing on the standards creation activities within a single standards development organization (SDO) e.g. ITU-T,

IETF, IEEE, etc. Though some work has already been done in exploring specific standards practices in different SDOs, e.g. Severance (1995), the findings of this study can be combined with findings of these other works to extend the emergent grounded theory for standards creation involvement of a product development company in specific standards development organizations.

Yet another area of possible further research is standards involvement for other purposes, e.g. defensive standards activities where the attempt is to prevent competitors from defining standards that are not suitable for the company.

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Appendix A: Archival Data Analysis Template

Standards Project: P#	
Collected Data	
Need Spotting (why is the standard needed, who is asking for it)	xxx
Goal (what is the goal of standardization)	xxx
Outcome (what is a tangible desired outcome)	xxx
Company-level Dimensions	
Business Pros (general business interests)	xxx
Business Cons (any downsides)	xxx
Product/technology Pros (specific interests)	xxx
Product/technology Cons (specific downsides)	xxx
Challenges (internal)	xxx
Others?	xxx
Industry-level Dimensions	
Ongoing Std. Activity (any on-going standards activities, at introduction, currently)	xxx
Regulatory Alignment (any regulatory influence)	xxx
Customer Alignment (any customer influence)	xxx
Competition Alignment (any competition influence)	xxx
Challenges (external)	xxx
Others?	xxx
Observed Data	
Success Factors (Given Circumstances)	
% LOB interested (one or more)	xxx
% LOB adversely impacted (one or more)	xxx
% revenue of represented LOB (wrt to entire company)	xxx
Regulatory motivation (comments)	xxx
Customer motivation (comments)	xxx
Standards leadership positions (existing standards leaders?)	xxx
Technology leadership positions (existing visible technical experts)	xxx
Past standards experience (within the same SDO, technology)	xxx
Vision for legacy compliance & future-proof (is this innovative and/or disruptive)	xxx
Relationship to related Std. Projects (any other standards projects related to this project)	xxx
Technical expertise (do we have enough technical clout to influence)	xxx
# Votes (do we have enough votes to influence)	xxx
Involvement of multi-disciplinary team (do we have different	xxx

stakeholders involved in standardization)	
IPR (do we have any IPR)	xxx
Others?	xxx
Standards Involvement Dimensions (Execution Plan)	
Internal Coordination (comments on internal coordination)	xxx
Alliance with competitors (comments on attempts to form alliances with competition)	xxx
# SDOs (standardization focus on one or more SDOs)	xxx
Choice of SDOs (comments on rationale for SDOs selection)	xxx
Leadership positions (comments on creating leadership positions for this activity)	xxx
Proactive in capturing opportunities (any opportunities seized for leadership)	xxx
Extent of standardization seeked (comments on investment levels)	xxx
Vigilance during standardization (comments: visibility to competitors news releases, other standardization maneuvers etc)	xxx
# Std Attendees (comment on full time – dedicated/accountable vs. part time)	xxx
% Std Attendees (when compared to main competitors)	xxx
Mailing list leadership (comments on perceived leadership)	xxx
Alliance with customers (comments on attempts to form alliances)	xxx
Responsiveness to competition attack – Technical & FUD (comments on how soon and effectively competition attacks are dealt with)	xxx
Regional/global standardization (comments on regional boundaries of standardization focus)	xxx
Form a formal SDO (Comments on attempts made to create a new group/SDO etc.)	xxx
Others?	xxx
Success Measures (Desired Outcomes)	
Impact on revenue (comments)	xxx
Impact on revenue/Alignment with own technology (comments)	xxx
Impact on revenue/Alignment with own products (comments)	xxx
Impact on revenue/Opportunity for competition (comments)	xxx
Competitive Intelligence (comments)	xxx
Change in competitive technology (comments)	xxx
Business Opportunity Creation - Customer/Market requirements (Comments)	xxx
Extent of technology standardized (comments)	xxx
Timing of std. wrt products (comments)	xxx
Establish technological leadership (comments)	xxx
Establish a standards project activity (comments)	xxx

Appendix B: Survey Instrument 1 for Secondary Data Collection

What is this questionnaire? This Survey is designed to collect information on different aspects of standards involvement for relevant **on-going standards projects** inside Company ABC. This information is being collected for the purposes of an academic research titled: "Standards Creation Involvement in a Large Telecom Product Development Company: A Grounded Theory".

Why are you receiving this questionnaire? You are either leading an on-going standards project inside Company ABC which has been identified as being relevant for *this academic research*. The researcher will be happy to share the results of the research with you.

What is the context of this questionnaire? The research is focusing on the following three aspects of standards involvement for a given standards project:

- **Factors**: Circumstances at the onset of the standards involvement
- **Dimensions** of standards involvement strategy and execution (strategic dimensions - why, what, and when; tactical dimensions - how, who, and where)
- **Outcomes**: Targeted and desired outcomes.

This Survey focuses on the factors, dimensions and outcomes of standards involvement.

What is the expected time to complete this questionnaire? ~45 minutes.

Instructions to complete this questionnaire

- Most questions are multiple choice questions.
- Please mark your answers by encircling or placing an X against your choice.
- For others questions, please answer in brief statements.
- Feel free to add comments against any question to augment your response.
- **Please answer the questions to the best of your knowledge; the Survey accounts for the approximations.**

Contact Person: Dinesh Mohan (Contact information)

Respondent's Name:
Respondent's Contact No:
Standards Project Name:
Date of response:

Q 1. What **percentage** of the standards project **has been completed**?

0-10%	10-25%	25-50%	50-75%	75-90%	>90%	Other (please specify)

Dimension – What?

Q 2. What is the **focus of this standards project**? (E.g. new technology standardization, new feature standardization on existing technology, etc.)

Please specify:

Q 3. The technology/feature being standardized **competes with Company ABC's past** technology/feature **investments.**

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Please specify:

Q 4. The technology/feature being standardized **competes with Company ABC's other on-going** technology/feature **investments.**

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Please specify:

Q 5. This standards project **relates to** Company ABC's **other completed** standards project(s).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 6. This standards project **relates to** Company ABC's **other on-going** standards project(s).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Please specify:

Dimension – Why?

Q 7. What was the **percentage of business units in Company ABC** (e.g. LOBs - lines of businesses, etc) **interested** in this standards project **at the onset**? Please provide your best estimate.

0-10%	10-25%	25-50%	50-75%	75-100%	Other (please specify)

Q 8. What is the **percentage of business units in Company ABC** **currently interested** in this standards project? Please provide your best estimate.

0-10%	10-25%	25-50%	50-75%	75-100%	Other (please specify)

Q 9. What was the **estimated percentage revenue of business units in Company ABC interested** in this standards project **at the onset**? Please provide your best estimate.

0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	>50%	Other (please specify)

Q 10. What is the **estimated percentage revenue of business units in Company ABC** currently **interested** in this standards project? Please provide your best estimate.

0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	>50%	Other (please specify)

Q 11. **Other Company ABC groups**, besides product business units (e.g. CTO group), were **interested** in this standardization **at the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 12. **Other Company ABC groups**, besides product business units (e.g. CTO group), are **currently interested** in this standardization.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 13. **Regulatory factor(s)** influenced the need for this standardization.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 14. Company ABC's **existing customers** were **interested** in this standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 15. Company ABC's **existing customers** are **currently interested** in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 16. Company ABC's **targeted customers** were **interested** in this standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 17. Company ABC's **targeted customers** are **currently interested** in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 18. Company ABC's **suppliers** (e.g. component vendors) were **interested** in this standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 19. Company ABC's **suppliers** (e.g. component vendors) are **currently interested** in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 20. **Some** of Company ABC's **competitors** were **opposed** to Company ABC's standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 21. **Some** of Company ABC's **competitors** are **currently opposed** to Company ABC's standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 22. **Some** of Company ABC's **competitors** were **supportive** of Company ABC's standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 23. **Some** of Company ABC's **competitors** are **currently supportive** of Company ABC's standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 24. **Some** of Company ABC's **competitors had alternative technology/feature** for standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 25. **Some** of Company ABC's **competitors currently have alternate technology/feature** for standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 26. Company ABC's standards **project is a response to** competitors' related standardization activities.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 27. Company ABC's **Intellectual Property** (either in progress or completed e.g. patents) is involved in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 28. This standards **project aims to disrupt competitors' competing technology/feature** standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 29. This standards **project aims to gain competitive intelligence** via standardization activities.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 30. This standards **project aims to establish Company ABC as a technology leader** to gain mindshare in related technology area(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 31. This standards **project aims to attract Company ABC's customer base** for newer business opportunities in related technology area(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 32. Are there **any other objectives of this standards project** (besides respond to competition, protect IPR, disrupt competition, gain competitive intelligence, create mindshare, and/or create business opportunities)? If yes, please state.

Yes No Don't Know

Please specify:

Dimension – When?

Q 33. **Technology/feature** being standardized was **already available** on at least some of related Company ABC product(s) **at the onset** (e.g. was in **GA**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 34. **Technology/feature** being standardized was **being implemented** on at least some of related Company ABC product(s) **at the onset** (e.g. was in **POR**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 35. **Technology/feature** being standardized was **planned to be implemented** on at least of some of related Company ABC product(s) **at the onset** (e.g. was in **POI**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 36. **Technology/feature** being standardized is **currently available** on at least some of related Company ABC product(s) (e.g. is currently in **GA**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 37. **Technology/feature** being standardized is **currently being implemented** on at least some of related Company ABC product(s) (e.g. is in **POR**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 38. **Technology/feature** being standardized is **currently planned to be implemented** on at least some of related Company ABC product(s) (e.g. is in **POI**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 39. **Technology/feature** being standardized **will be implemented only after completion of standard**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Dimension – How?

Q 40. This standards project's **approach** is to _____ the standardization.

Lead Participate Monitor

Others, please specify:

Q 41. A clearly identified **involvement strategy is available** for this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 42. As part of this standards involvement, **alliances** are **being made** with Company ABC's **existing customers**.

1	2	3	4	5	6	7	DNK	NA

Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 43. As part of this standards involvement, **alliances** are **being made** with Company ABC's **targeted customers**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 44. As part of this standards involvement, **alliances** are **being made** with Company ABC's **suppliers** (e.g. component vendors).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 45. As part of this standards involvement, **alliances** are **being made** with Company ABC's **competitors**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 46. As part of this standards involvement, **political leadership positions** have been sought or are being **sought** (e.g. WG Chairmanship, Rapporteur, etc.).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 47. As part of this standards involvement, **technical leadership positions** have been sought or are being **sought** (e.g. Editorship, etc.).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 48. Standards involvement strategy is **being complemented with** Company ABC's **technical marketing actions** (e.g. conferences, seminars, etc.).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 49. Standards involvement strategy is **being complemented with** Company ABC's **product marketing actions** (e.g. product white papers, analyst briefings, etc.).

1	2	3	4	5	6	7	DNK	NA

Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 50. As part of standards involvement strategy, Company ABC **is dealing aggressively with technical level attacks** on this standardization (e.g. immediately).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 51. As part of standards involvement strategy, Company ABC is **dealing aggressively with marketing level attacks** on this standardization (e.g. immediately).

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Dimension – Who?

Q 52. A **multi-disciplinary team** in Company ABC is involved in this standardization.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 53. A **clearly identified resource** was **accountable** for this standards project **at the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 54. A **clearly identified resource** is **currently accountable** for this standards project.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 55. **Product team/individual** is **directly responsible** for this standards project. If answer is 6-7, skip 55.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 56. **Standards team/individual** is **directly responsible** for this standards project.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 57. **One or more product team/individuals** are **dedicated full time** to this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 58. **One or more standards individuals** are **dedicated full time** to this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 59. **Product development team(s)** is **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 60. **Product development team(s)** is **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 61. **Product marketing team(s)** is **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 62. **Product marketing team(s)** is **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 63. **Product sales team(s)** is **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 64. **Product sales team(s)** is **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 65. **Leadership team(s)/Executives** (e.g. VPs, GMs, etc.) are **interested** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 66. **Enough Company ABC resources** are **available to attend** applicable external **standards meetings.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 67. **Enough Company ABC resources** are **available to write** applicable external **standards contributions.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 68. **Enough Company ABC resources** are **available to participate** in applicable external **standards mailing lists.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 69. Are **any other Company ABC groups associated with** the standards project (besides Company ABC's standards team, product development teams, product marketing team, product sales team, executives)? If yes, please specify.

Yes No Don't Know

Please specify:

Dimension – Where?

Q 70. Company ABC's standardization focus is limited to following **number of SDOs** (Standards Definition Organization) (SDOs include accredited, national, international, regional, forums etc.).

1	2	3	4	5	6	7-or more	DNK	NA
						Strongly	Do	Not

						agree	not know	Applicable

Q 71. **Name each SDO included** in this standardization and state a **brief rationale for inclusion.**

SDO #1, inclusion rationale:
SDO #2, inclusion rationale:
SDO #3, inclusion rationale:
SDO #4, inclusion rationale:

Q 72. Company ABC's standardization focus **excluded one or more applicable SDO.** If answer is 1-3, skip 73.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 73. For each SDO excluded in this standardization, please state a brief **rationale for exclusion.**

SDO #1, exclusion rationale:
SDO #2, exclusion rationale:
SDO #3, exclusion rationale:
SDO #4, exclusion rationale:

Q 74. Company ABC created/started a **new formal/informal SDO** as part of this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 75. For each SDO included in this standardization, **characterize** Company ABC's **initial meeting presence** (in numbers) in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, meeting presence:
SDO #2, meeting presence:
SDO #3, meeting presence:
SDO #4, meeting presence:

Q 76. For each SDO included in this standardization, **characterize** Company ABC's **current meeting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, meeting presence:
SDO #2, meeting presence:
SDO #3, meeting presence:
SDO #4, meeting presence:

Q 77. For each SDO included in this standardization, **characterize** Company ABC's **initial voting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, voting presence:
SDO #2, voting presence:
SDO #3, voting presence:
SDO #4, voting presence:

Q 78. For each SDO included in this standardization, **characterize** Company ABC's **current voting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, voting presence:
SDO #2, voting presence:
SDO #3, voting presence:
SDO #4, voting presence:

Q 79. For each SDO included in this standardization, **characterize** Company ABC's **prior influence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, prior influence:
SDO #2, prior influence:
SDO #3, prior influence:
SDO #4, prior influence:

Q 80. For each SDO included in this standardization, did Company ABC's hold **political leadership positions** (e.g. WG Chairmanship, Rapporteur, etc.) **at the onset**?

Yes No Don't Know

SDO #1, political leadership position at onset:
SDO #2, political leadership position at onset:
SDO #3, political leadership position at onset:
SDO #4, political leadership position at onset:

Q 81. For each SDO included in this standardization, did Company ABC's hold **technical leadership positions** (e.g. Editorship etc.) **at the onset**?

Yes No Don't Know

SDO #1. technical leadership position at onset:
SDO #2. technical leadership position at onset:
SDO #3. technical leadership position at onset:
SDO #4. technical leadership position at onset:

Expected Outcomes

Q 82. **Creation of a standards track activity** within one or more of the included SDO(s) is/was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 83. **Creation of a standard** is **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 84. **Increased business opportunity** as a result of eventual standard **is one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 85. **Disruption in competitors' revenue or market share** as a result of eventual standard is **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 86. **Disruption in competitors' current implementations** as a result of eventual standard is **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 87. **Competitive intelligence** as a result of ongoing standards involvement **is one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 88. **Assertion of Company ABC as a technology leader** as a result of ongoing standards involvement is **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 89. Are there **any other desirable outcomes that are being targeted** as part of this standards project (besides increased business opportunity, disrupting competitors' market share, disrupting competitors' current implementations, competitive intelligence, and/or assertion of Company ABC as a technology leader)? If yes, please specify.

Yes No Don't Know

Please specify:

Appendix C: Survey Instrument 2 for Secondary Data Collection

What is this questionnaire? This Survey is designed to collect information on different aspects of standards involvement for relevant **Completed standards projects** inside Company ABC. This information is being collected for the purposes of an academic research titled: "Standards Creation Involvement in a Large Telecom Product Development Company: A Grounded Theory".

Why are you receiving this questionnaire? You either led or were associated with a completed standards project inside Company ABC, which has been identified as being relevant for this academic research. The researcher will be happy to share the results of the research with you.

What is the context of this questionnaire? The research is focusing on the following three aspects of standards involvement for a given standards project:

- **Factors**: Circumstances at the onset of the standards involvement
- **Dimensions** of standards involvement strategy and execution (strategic dimensions - why, what, and when; tactical dimensions - how, who, and where)
- **Outcomes**: Targeted and desired outcomes.

This Survey focuses on the factors, dimensions and outcomes of standards involvement.

What is the expected time to complete this questionnaire? ~45 minutes.

Instructions to complete this questionnaire

- Most questions are multiple choice questions.
- Please mark your answers by encircling or placing an X against your choice.
- For others questions, please answer in brief statements.
- Feel free to add comments against any question to augment your response.
- **Please answer the questions to the best of your knowledge; the Survey accounts for the approximations.**

Contact Person: Dinesh Mohan (Contact information)

Respondent's Name:
Respondent's Contact No:
Standards Project Name:
Date of response:

Dimension – What?

Q 1. What was the **focus of this standards project**? (E.g. new technology standardization, new feature standardization on existing technology, etc.)

Please specify:

Q 2. The standardized technology/feature was in **competition with** Company ABC's other technology/feature **investments.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 3. This standards project **related to** Company ABC's **other past** standards project(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 4. This standards project **relates to** Company ABC's **other on-going** standards project(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Dimension – Why?

Q 5. What was the **percentage of business units in Company ABC** (e.g. LOBs - lines of businesses, etc) **interested** in this standardization **at the onset**? Please provide your best estimate.

0-10%	10-25%	25-50%	50-75%	75-100%	Other (please specify)

Q 6. What was the **percentage of business units in Company ABC interested** in this standards project **following the onset**? Please provide your best estimate.

0-10%	10-25%	25-50%	50-75%	75-100%	Other (please specify)

Q 7. What was the **estimated percentage revenue of business units in Company ABC interested** in this standards project **at the onset**? Please provide your best estimate.

0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	>50%	Other (please specify)

Q 8. What was the **estimated percentage revenue of business units in Company ABC interested** in this standards project **following the onset**? Please provide your best estimate.

0-5%	5-10%	10-20%	20-30%	30-40%	40-50%	>50%	Other (please specify)

Q 9. **Other Company ABC groups**, besides product business units (e.g. CTO group), were **interested** in this standards project **at the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 10. **Other Company ABC groups**, besides product business units (e.g. CTO group), were **interested** in this standards project **following the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 11. **Regulatory factor(s)** influenced the need for this standardization.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 12. Company ABC's **existing customers** were **interested** in this standardization **at the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 13. Company ABC's **existing customers** were **interested** in this standardization **following the onset**.

1 Strongly disagree	2 Disagree	3 Disagree somewhat	4 Neutral	5 Agree somewhat	6 Agree	7 Strongly agree	DNK Do not know	NA Not Applicable

Q 14. Company ABC's **targeted customers** were **interested** in this standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 15. Company ABC's **targeted customers** were **interested** in this standardization **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 16. Company ABC's **suppliers** (e.g. component vendors) were **interested** in this standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 17. Company ABC's **suppliers** (e.g. component vendors) were **interested** in this standardization **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 18. **Some** of Company ABC's **competitors** were **opposed** to Company ABC's standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 19. **Some** of Company ABC's **competitors** were **opposed** to Company ABC's standardization **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 20. **Some** of Company ABC's **competitors** were **supportive** of Company ABC's standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 21. **Some** of Company ABC's **competitors** were **supportive** of Company ABC's standardization **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 22. **Some** of Company ABC's **competitors had alternative technology/feature** for standardization **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 23. **Some** of Company ABC's **competitors had alternate technology/feature** for standardization **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 24. Company ABC's standards **project was a response to** competitors' related standardization activities.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 25. Company ABC's **Intellectual Property** (e.g. in progress or completed patent) was involved in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 26. This standards **project aimed to disrupt competitors' competing technology/feature** standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 27. This standards **project aimed to gain competitive intelligence** via standardization activities.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 28. This standards **project aimed to establish Company ABC as a technology leader** to gain mindshare in related technology area(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 29. This standards **project aimed to attract Company ABC's customer base** for newer business opportunities in related technology area(s).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 30. Were there **any other objectives of this standards project** (besides respond to competition, protect IPR, disrupt competition, gain competitive intelligence, create mindshare, and/or create business opportunities)? If yes, please state.

Yes No Don't Know

Please specify:

Dimension – When?

Q 31. **Technology/feature** being standardized was **already available** on at least some of related Company ABC product(s) **at the onset** (e.g. was in **GA**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 32. **Technology/feature** being standardized was **being implemented** on at least some of related Company ABC product(s) **at the onset** (e.g. was in **POR**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 33. **Technology/feature** being standardized was **planned to be implemented** on at least some of related Company ABC product(s) **at the onset** (e.g. was in **POI**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 34. **Technology/feature** being standardized was **later available** on at least some of related Company ABC product(s) **following the onset** (e.g. was later in **GA**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 35. **Technology/feature** being standardized was **later being implemented** on at least some of related Company ABC product(s) **following the onset** (e.g. was later in **POR**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 36. **Technology/feature** being standardized was **later planned to be implemented** on at least some of related Company ABC product(s) **following the onset** (e.g. was later in **POI**).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 37. **Technology/feature** being standardized was **planned to be implemented only after the completion of standard**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Dimension – How?

Q 38. This standards project **approach** was to _____ the standardization.

Lead Participate Monitor

Others, please specify:

Q 39. A clearly identified **involvement strategy was available** for this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 40. As part of this standards involvement, **alliances** were made **with** Company ABC's **existing customers**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 41. As part of this standards involvement, **alliances** were made **with** Company ABC's **targeted customers**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 42. As part of this standards involvement, **alliances** were **made** with Company ABC's **suppliers** (e.g. component vendors).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 43. As part of this standards involvement, **alliances** were **made** with Company ABC's **competitors**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 44. During this standardization, Company ABC **made attempts to seek political leadership positions** in related working groups (e.g. WG Chairmanship, Rapporteur, etc.). If answer is 1-2, skip 45.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 45. During this standardization, Company ABC was **successful in gaining political leadership positions** in related working groups (e.g. WG Chairmanship, Rapporteur, etc.).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 46. During this standardization, Company ABC **made attempts to seek technical leadership positions** in related working groups (e.g. Editorship, etc.). If answer is 1-2, skip 47.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 47. During this standardization, Company ABC was **successful in gaining technical leadership positions** in related working groups (e.g. Editorship, etc.).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 48. Standards involvement strategy was **complemented with** Company ABC's **technical marketing actions** (e.g. conferences, seminars, etc.).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 49. Standards involvement strategy was **complemented with** Company ABC's **product marketing actions** (e.g. product white papers, analyst briefings, etc.).

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 50. As part of standards involvement strategy, Company ABC **dealt aggressively with technical level attacks** on this standardization (e.g. immediately). If answer is 1-2, skip 51.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 51. Company ABC was **mostly effective in dealing with technical level attacks** on this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 52. As part of standards involvement strategy, Company ABC **dealt aggressively with marketing level attacks** on this standardization (e.g. immediately). If answer is 1-2, skip 53.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 53. Company ABC was **mostly effective in dealing with marketing level attacks** on this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Dimension – Who?

Q 54. A **multi-disciplinary team** in Company ABC was involved in this standardization.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 55. A **clearly identified resource** was **accountable** for this standards project **at the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 56. A **clearly identified resource** was **accountable** for this standards project **following the onset**.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 57. **Product team/individual** was **directly responsible** for this standards project. If answer is 6-7, skip 56.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 58. **Standards team/individual** was **directly responsible** for this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 59. **One or more product team/individuals** were **dedicated full time** to this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 60. **One or more standards individuals** were **dedicated full time** to this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 61. **Product development team(s)** was **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 62. **Product development team(s)** was **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 63. **Product marketing team(s)** was **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 64. **Product marketing team(s)** was **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 65. **Product sales team(s)** was **directly involved** in this standards project (e.g. attend standards meetings, write contributions, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 66. **Product sales team(s)** was **indirectly involved** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 67. **Leadership team/Executives** (e.g. VPs, GMs, etc.) were **interested** in this standards project (e.g. attend standards strategy calls, query about project status, etc.)

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 68. **Enough Company ABC resources** were **available to attend** applicable external **standards meetings.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 69. **Enough Company ABC resources** were **available to write** applicable external **standards contributions.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 70. **Enough Company ABC resources** were **available to participate** in applicable external **standards mailing lists.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 71. Were **any other Company ABC groups associated with** the standards project (besides Company ABC's standards team, product development teams, product marketing team, product sales team, executives)? If yes, please specify.

Yes No Don't Know

Please specify:

Dimension – Where?

Q 72. Company ABC's standardization focus was limited to following **number of SDOs** (Standards Definition Organization) (SDOs include accredited, national, international, regional, forums etc.).

1	2	3	4	5	6	7-or more	DNK	NA
						Strongly agree	Do not know	Not Applicable

Q 73. **Name each SDO included** in this standardization and state a **brief rationale for inclusion.**

SDO #1, inclusion rationale:
SDO #2, inclusion rationale:
SDO #3, inclusion rationale:
SDO #4, inclusion rationale:

Q 74. Company ABC's standardization focus **excluded one or more applicable SDO.** If answer is 1-3, skip 75.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 75. For each SDO excluded in this standardization, please state a brief rationale for exclusion.

SDO #1, exclusion rationale:
SDO #2, exclusion rationale:
SDO #3, exclusion rationale:
SDO #4, exclusion rationale:

Q 76. Company ABC created/started a **new formal/informal SDO** as part of this standards project.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 77. For each SDO included in this standardization, **characterize** Company ABC's **initial meeting presence** (in numbers) in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, meeting presence:
SDO #2, meeting presence:
SDO #3, meeting presence:
SDO #4, meeting presence:

Q 78. For each SDO included in this standardization, **characterize** Company ABC's **eventual meeting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, meeting presence:
SDO #2, meeting presence:
SDO #3, meeting presence:
SDO #4, meeting presence:

Q 79. For each SDO included in this standardization, **characterize** Company ABC's **initial voting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, voting presence:
SDO #2, voting presence:
SDO #3, voting presence:
SDO #4, voting presence:

Q 80. For each SDO included in this standardization, **characterize** Company ABC's **eventual voting presence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, voting presence:
SDO #2, voting presence:

SDO #3, voting presence:
SDO #4, voting presence:

Q 81. For each SDO included in this standardization, **characterize** Company ABC's **prior influence** in applicable groups **compared to competition.**

1	2	3	4	5	6	7	DNK	NA
Quite Insignificant	Low	Below Average	At Par	Above Average	High	Quite Significant	Do not know	Not Applicable

SDO #1, prior influence:
SDO #2, prior influence:
SDO #3, prior influence:
SDO #4, prior influence:

Q 82. For each SDO included in this standardization, did Company ABC's hold **political leadership positions** (e.g. WG Chairmanship, Rapporteur, etc.) **at the onset**?

Yes No Don't Know

SDO #1, political leadership position at onset:
SDO #2, political leadership position at onset:
SDO #3, political leadership position at onset:
SDO #4, political leadership position at onset:

Q 83. For each SDO included in this standardization, did Company ABC's hold **technical leadership positions** (e.g. Editorship etc.) **at the onset**?

Yes No Don't Know

SDO #1, technical leadership position at onset:
SDO #2, technical leadership position at onset:
SDO #3, technical leadership position at onset:
SDO #4, technical leadership position at onset:

Actual Outcomes

Q 84. **Creation of a standards track activity** within one or more of the included SDO(s) **was one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 85. **Creation of a standard** was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 86. **Increased business opportunity** as a result of eventual standard was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 87. **Disruption in competitors' revenue or market share** as a result of eventual standard was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 88. **Disruption in competitors' current implementations** as a result of eventual standard was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 89. **Competitive intelligence** learnt as a result of ongoing standards involvement was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 90. **Assertion of Company ABC as a technology leader** as a result of ongoing standards involvement was **one of the targeted outcomes.**

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 91. **Timing of introduction** for this technology/feature **standardization was favorable** for Company ABC.

1	2	3	4	5	6	7	DNK	NA
Strongly disagree	Disagree	Disagree somewhat	Neutral	Agree somewhat	Agree	Strongly agree	Do not know	Not Applicable

Q 92. Were there **any other desirable outcomes** from this standards project (besides increased business opportunity, disrupting competitors' market share, disrupting competitors' current implementations, competitive intelligence, and/or assertion of Company ABC as a technology leader)? If yes, please specify.

Yes No Don't Know

Please specify:

Q 93. Were there **any undesirable outcomes** from this standards project? If yes, please specify.

Yes No Don't Know

Please specify:

Appendix D: Lines of Inquiry use for Case Studies

The following questions highlight the general lines of inquiry that were used during the case interviews to maintain some open-ended questions to establish a general context and perspective, and probing questions to establish details, conducted according to accepted interviewing best practices (Foddy, 1993).

Q1. What was Company ABC's main objective of the standards project?

Q2. Who were some of the main players (external) involved in the standard?

Q3. Was this standard somehow related to other past or present Company ABC technologies e.g. competed against or supported?

Q4. It is perceived to be a successful Standards project. Your comments?

Q5. What would you attribute as some measures applied to declare success from Company ABC point of view?

Q6. What were some major factors responsible for the success of this project?

Q7. What were some key aspects of our strategy in different bodies involved?

Q8. How would you relate the success of this standards project to the success of product groups?

Q9. Were there any marketing activities related to the standards project?

Q10. Who were the key Company ABC Stakeholders involved in the standard?

Q11. Were there aspects of this project that were typical to a large organization and would not have been possible for a smaller organization?

Q12. Looking back, was there anything that you would have done differently?

Q13. What were some of the key lessons learnt in this standards project?

Q14. What are some of the key message that you would like to impart to some of the ongoing standards project?

Appendix E: Condensed Code List

Observation	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06
Case Study Type						
New Technology?	y	y	y	y	y	y
Company ABC initiated Std activity?	n	n	n	y	y	y
Prototype available before Std activity?	y	y	y	y	n	y
Products available before Std activity?	n	y	n	n	n	n
Product available during Std activity?	n	y	y	?	y	y
Competitive information augmented Company ABC interest	y	y	y	y	y	y
Competing technology present internally?	y	n	n	y	n	y
Purely software activity?	n	n	n	n	y	n
Success Measures						
Getting a specification within the parameters we requested	y	y	y	y	y	y
Leadership and external credibility		y	y	y	y	y
Market size created/Eco system built		y		y	y	
Vindication of research effort and direction and/or validation for design direction		y	y	y	y	
Market share for Company ABC created				y	y	
Learning and experience		y		y		
Effectiveness of resources		y			y	
Circumstances						
Other vendors working on their own implementations and interested, market drive and value seen	y	y	y	y	y	y
Support of the service providers/customer pull	y		y	y	y	y
Pertinent parties involved internally (particularly development team and standards team members, along with marketing etc.)	y	y		y	y	y
Longevity, energy, patience, resources (big company)	y	y	y	y	y	
External environment - business was better, higher expectations and projections	y	y	y			
Presence of mediating, coordinating internal group (e.g. Network planning, etc.)(being able to maintain the big picture)			y	y	y	
Funding environment - executives could fund a new technology without clear understanding	y			y		
Support from top management/executives, value was seen	y		y			
Industry was small, stable, predictable (players clear about their roles, SDOs were clear on their roles)			y	y		
Success Factors						
Brought together internal stakeholders around a common specification (teamwork) + Consistent Messaging	y	y	y	y	y	
Alliances created to work the committee (SDO) (big company)	y	y		y		y
Longevity/patience to wear down competition	y	y	y	y		
Negotiated with competitors/value of compromise when significant competitors are involved	y	y		y	y	

Observation	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06
Prototyping helped to influence folks (e.g. carriers) in back room, or implementations	y		y	y	y	
Correct skill set (technical and political balance)		y			y	y
Coordination with Standards activities in other SDOs to either expand visibility or contain competition		y				y
Created a new forum (SDO)				y		y
Dealt with opposition by strong positions	y					
Timing of the standard - almost done but not completed to reflect our few key final I's and Ts.				y		
Other Observations						
Standards process is drawn out process with 3-4 for initial standard and almost equal duration to maintain it		y	y	y	y	
Complement standards strategy with business strategy	y	y		y		
Competition used Std to create avenue into new business, or for disruption	y	y				
Standards seen as a tool to build credible story				y		y
One should view Standards as a tool and not a necessary evil		y				
institutionalize learning from experience				y		y
Be more business driven than technology driven		y	y			
Longevity - interest faded internally over a period of time	y					
Standards success but a business failure	y					
Standards creation is not an academic exercise, but this is actually a political exercise with technical aspects.		y				
Mandate for standards involvement from development and management teams needs to come from Management teams		y				
Building the whole ecosystem was identified as a priority in beginning of standards activity				y		
Standards should be part of marketing, design, business plan						y