S/W-Eng is the goal-oriented provision and app of systematically, engr-like, & quantifiable procedures for development,operation,maintenance, & shutdown of software systems. **System**: Technical & organizational means for autonomous fulfilment of task. It consists of hardware, sw, people(service & maintenance personnel) & logistic assistance. **Tech Sys**: system where influences by people and logistics are ignored. **Quality:** Property of an entity concerning its qualification to fulfill defined and derived req (quality req). Degree in which the inherent attributes of an entity fulfil quality reqs. **Quality Req:** Expectation or demand defined that is generally assumed or mandatory. **Quality Characteristic:** Property of an entity on the basis of which its quality is described & esstimated, but which makes no statement about the degree of fulfillment of the characteristic. Inherent attribute of a process, product or a system that relates to a quality req. **Quality Measure**: Measure which allows to draw conclusions on the fulfillment of specific quality characteristics. E.g. MTTF is a quality measure of quality characteristic Reliability. **Safety:** State where the danger of a personal or property damage is reduced to an accepted value. Biriolini defines safety as a measure for the ability of an item to endanger neither persons, property nor the environment. **Tech Safety:** Measure for the ability of a failure afflicted item to endanger no persons,property or the env. **Error**: Basic cause for the fault (e.g. misunderstanding of a particular statement of the programming lang). **Fault/defect**: Statically existent cause of a failure,(i.e. bug). Usually the consequence of an error made by the programmer. **Failure**: Inconsistent behaviour w.r.t specified behaviour while running a sys(happens dynamically during the execution). Each failure has a time-stamp. **Diff:** {Error (misunderstanding of spec) causes fault (loop counter counts once too often) causes failure (system shuts down)}. **Correctness:** it has binary character. A fault-free realization is correct. An artefact is correct if it is consistent to its specification. If no specification exists, correctness is not defined. **Completeness:** A system is functional complete if all functions required in the specification are implemented. **Robustness:** Property to deliver an acceptable behaviour also in exceptional situations. A correct system can have low robustness. Robustness is rather a property of specification than of implementation. A robust program is correct implementation of a good and complete specification. Robustness has gradual character. **Reliability:** Measure for the ability of an item to remain functional, expressed by the probability that the required function is executed failure-free under given working conditions during a given time period. **Availability:** Measure for the ability of an item to be functional at a given time. **Availability vs. Reliability: A=MTBF(**mean time btw failure)**/(MTTR(**mean time to repair)**+MTBF). Non Functional Requirements**: 1.Availability-readiness for correct service 2.Reliability- Continuity of correct service 3.Safety- Absence of catastrophic consequence on users and env 4.Confidentiality- Absence of unauthorized disclosure of information 5.Integrity- Absence of improper system state alterations 6. Maintainability- Ability to undergo repairs and modifications.

Quality Characteristics: Quality{Functionality{Suitability, Accuracy, Interoperability, Security, Functionality Compliance}, Reliability{Maturity, Fault Tolerance, Recoverability, Reliability Compliance}, Usability{Understandability, Learnability, Operability, Attractiveness, Usability Compliance}, Efficiency{Time Behavior, Resource Behavior, Efficiency Compliance}, Maintainability{Analyzability, Changeability, Stability, Testability, Maintainability Compliance}, Portability{Adaptability, Installability, Co-existence, Replaceability, Portability Compliance}}. **Positive/Negative Influence: i)Safety->Availability (Neg)**:Negative influence in systems with stable safe state, i.e. systems that can fail safe (E.g. train stops for safety reasons and therefore becomes unavailable). This doesn't apply for systems without stable safe state, i.e. systems that can't fail safe (E.g. Aeroplanes during a flight can't simply stop). **ii)Safety-Reliability iii)Reliability->Safety (Pos):**For safety related services, reliability has a positive influence on safety. This also applies for systems without a stable safe state. **iv)Reliability->Availability (Pos):**There is a positive influence from reliability to availability since a system that runs for a longer time without a failure will also have a better uptime/downtime ratio. **v)Availability-Reliability (Not Def):**The opposite isn't true since there can be an unreliable system with a high availability if the repair process is very fast.

QIP Goal: Support continuous improvement approach. Org learns by experimenting & in the end archive their experiences based on result of experiments. **Organizational learning:** 1. Characterize & und **2.** Set Goals **3.** Choose processes, methods, techniques, tools **4.** Perform Project **5.** Analyse results **6.** Package & store experience for future proj. **Project Learning: 4.1** Execute processes **4.2** Analyse results **4.3** Provide feedback. **Org achieve improvement using this because: i) Project Cycle**- The project feedback cycle provide feedback to the project during the execution phase in order to prevent and solve problems, monitor and support the project and to realign chosen processes with defined goals. **ii) Organizational Cycle**- The organizational feedback cycle provides feedback to the org after the completion of the project. The purpose is to analyze the concordance and discrepancy of the collected data against previous experiences and models.**Exp. Factory**- Logical & organizational structure for QIP, with purpose of collecting and reusing SDLC experience •[Plan{Product development and env characteristics}(QIP 1,2,3)->Conduct proj{Models(•Quality ,resources, Product, Process) •lessons learned •data}(QIP 4)->Evaluate{Feedback for improvement: Project analysis result and corrective measures}(QIP 5,6)] •[Plan->EF{Generalized models to be reused}. GQM and EF are applied to QIP steps 2 and 6 because the EF is only responsible for packaging, storing and generalizing. **EF Packages:** • Product Packages {Programs, Architectures, Design Models} •Process Packages {Process Models, Methods} •Relationship Packages {Cost and defect models, Resource models} •Management Packages {Management handbooks, Decision support models} •Data packages {Project database, Quality records}. **Pkgd info in EF:** Experience obtained by performing previous sw dev projects is stored in the EF in the form of: process, products, quality models, lessons learned, techniques, methods, tools, etc. **GQM-Goal**: the spec of a measurement sys targeting a particular set of issues & rules for interpret of meas data. The org needs to be able to trace goals to the data that are intended to define those goals operationally and have a framework for interpreting it. **Goals are refined into matrices:** Based upon models of the object of measurement that deals with the issues of the goals, questions are derived that define those goals as completely as possible. Then measures that need to be collected in order to answer those questions should be specified. A metric is used for interpreting the measures. **Goals are associated with metrics** for traceability because if not done, you cannot be sure that the measure describes some organizational goal. **GQM Process:** 1. Develop GQM model to obtain measurement plan– Identify goals, derive a set of questions, specify the measures that should be collected in order to answer the questions. 2. Implement data collection, validation and analysis mechanisms. 3. It guarantees that no unnecessary measurement data is collected. **GQM+Strategies-**org Business goals->S/w goal->measurement goals{question, metric}. **TQM:** "Mngt method based on co-op of all members of org which centres quality & by consumer satisfaction aims at long-term commercial success as well as utility for members of the org and for society." **QA vs TQM** •**Goals-(**Better products, Lower costs**)**(Better mgmnt,Custsatisf,Flexibility**)•Orientation(**Product**)(**Market,process**)•Org(**Strong position of QA**)(**All activities focus on quality**)•Quality responsibility(**Quality representative/agent**)(**Line mngmt,Every staff memb**)•Method(**Measurements, Checks/inspections/tests, Failure rec & failure eval**)(**Institutionalized prog for error reduction,Process monitoring & process optimization,Optimi in own area of operation**). Six Sigma-OBJ**: improve the quality of products thru identification & removal of defects & variability existing in manufacturing processes. 2. It defines two Improvement cycles based on Deming approach **•DMAIC**(Define,Measure,Analy,Impro,Control)- to improve existing business processes **•DMADV**(Def,Mea,Ana,Design,Verify)- to design & implement new processes. SS is supported by tools & techniques: QFD, Pareto Analysis & Cause-effect diagrams.

SPC: Means for differentiating a statistical variation of a process from a systematic one. Machine accuracy, process accuracy, predefined tolerance, sorting. **Charts** •Charts for variable characteristics (measurements). Average/mean value-chart (x -chart) combined with distribution-chart (s-chart) •Charts for attributive characteristics (countable characteristics (faults) or properties (good/bad)). **Difference:** charts for variable characteristics can reveal trends before problems are generated, charts for attributive characteristics are based on already existent problems. **Reliability Modelling**-Probability that a unit remains functional under predetermined conditions during a particular period of time. Reliability is a statistical value which can be estimated when corresponding failure models are taken as a basis. Failure rate = 1/MTTF. **Quality Circles** Group of few staff members which meets regularly with the aim to solve quality problems occurring in their work area resp. to introduce improvements actively. Weekly meeting, realization of problem, problem identification, top management participation. **Procedure: •Problem identification, problem selection**•Selection of problems to be analyzed•Application of creativity techniques for the problem identification•Prioritization of problems **•Problem handling**• Authorization by decision making department•Coordination with other quality circles•Separation of primary causes and secondary causes•Define goals•Search for solutions (e.g. with brainstorming)•Evaluate alternatives and choose solutions **•Presentation of results**•Present solution to the decision making circle and prepare realization **•Introduction and control of success**• Introduce solution•Documentation of problem, way of solution and result•Control of success (preferably quantitatively)•Generalization (transmission to other parts of the organization). **Failure Mode, Effects and Criticality Analysis (FMECA)**•Method that aims at risk prevention by identifying the failure modes of a system their causes and related effects•Risk evaluation with the aid of the risk priority number*RPN = occurrence probability*weight of the effects*probability of non-detection•Development of proposals for measures•Decision of measures•Analysis of residual risk (recalculation of the RPN)•Execution of cost benefit analysis. **Cause & Effect diag (Fishbone, Ishikawa):**Graphical technique for the analysis of cause&effect interrelations. To a problem (effect) the primary causes are identified which are further refined into secondary causes etc. **Procedure** •Def prob (effect) & attach it to head of "fishbone"•Attach major causes to "sidewise fishbones"**(6 M: man,machine,method,material, milieu,measuring)** •1.Measurement(calibrations,microscopes,inspectors)2.Materials(Alloys,Lubricants,Suppliers)3.Personnel(Shifts,training,operators)4.Environment(Humidity,Temp)5.Methods(angle,engagers,rake)6.Machines(blade wear, speed)7.Milieu(no motivation,incompatible).[Material,Machine,Methods,human power,Milieu,Management and Money, Mainatenanace][Suppliers,Surroundings,systems,scope of skills, standard documentation] •Attach minor causes to branches of "sidewise fishbones" (brainstorming: identification with aid of ques: what, why, how,who,when,where) •Identification of real cause •Development of soln alternatives & choice of optimal soln •Intro of soln. **Pareto Analysis:** 20% of the defect causes 80% of the defects. Histogram(bar chart/diagram) which presents subsets ordered according to decreasing size from left to right. Additionally a sum curve of the bar heights can be applied. **Aims** at high efficiency concerning improvements by prioritization. **Correltn Diag**-Instrument for analysis of dependence between to characteristics based on a set of pairs of characteristics**. Statistical basis:** correlation coefficient. **Statistical vs Systematic Variation**: (Statistical var is when the outputs of a process vary normally & the variations r at an acceptable lvl)(Sys var is when a few outputs vary significantly & this usually denoted prob with machinery or raw materials.Such var must be addressed & fired).

Measurements: Sw qual meas is abt quantifying to what extent a sys or sw possesses desirable characteristics. This can be performed thru qualitative/quantitative means or mix of both. **Obj:** Reliability,number of faults,Safety.Helps to have more precise, predictable & repeatable control over sw dev process.So sw qual will improve. Substitutes quality &intuitive stmts abt sw for quantitative & reproducible stmts.**Measure use for SW dev:**Cyclomatic Comp,Halstead Measures.**Reqs of meas:**•Simplicity•Adequacy•Robustness•Timeliness•Analysability.**Calibration:** correlation btw measures & relevant char demands a calibration,which has to b adapted to changing situations if necessary.Empirical/theoretical model.**Measurement Scales(Draw TABLE-count,order,+/- ,x/%)**•While expressing abstract char as numerical value,it is necessary to figure out which operations can be reasonably performed on the values•**Nominal scale**-Free labeling of specific characteristics,Ex:Inventory # of lib books,Names of diff RE methods(SA,SADT,OOA,IM)•**Ordinal**-Mapping of ordered attribute's aspect to an ordered set of meas values,such that order is preserved.EX:Mapping of patient arrivals to waiting list in a medical practice•**Interval**-A scale which is still valid if transformations like g(x) =ax+b,with a>0 r applied.EX:Temp scales in deg Cels or Fahrenheit•**Rational**-Scale where numerical values can be related to each other(percentals tmts)Ex:Length in meters(It is twice as far from a to b than from c to d)•**Absolute**- Scale providing the only possibility to measure circumstances.EX:Counting.**Current impact of sw measurement:** flat mgmt structures, standardization wrt to sw dev, achieving high CMM lvl.**Findings**•Faults r not unidistri,Large modules not mean more faults, Many prob dont indicate lack of quality, Subseq dev provide similar res,Complexity measure is better than size of code,Speccomplexity measures display a good qual of fault prediction,It is poss to derive meas from sw design to predict code size&fault # at an early stage.Conclusion:A suitable combo of adequate complexity measures enables a directed identification of faulty modules. **prog length:N=N1+N2, Prog:Voca:n=n1+n2, Volume:V=N.log2(n), Difficulty:D=(n1.N2)/2n2, Effort:E=D.V**

V-MODEL XT: is a special model which is very useful for planning,developing & analyzing sw projects & models. **GOALS of XT Dev:** Enhance support for Practicability, Adaptability, Changeability, Expandability, Scalability of V-Model•Consider state of art & adapt curr regulations & stds•Expand app range wrt consider the whole sys lifecycle in scope of dev proj•Introduce a process of organizational improvements for process models. **OBJ:**•Minimize proj risks•Qual improvement & qual guarantees•Budget containment for whole proj & sys life-cycle•Communication improvements btw all participants. **Process Module**:[Activity{contains subordinate activities}]—edits—(Product{contains subordinate products, has dependencies to other}) – responsible – Role. **V Model Client:** Project approved–Project defined – requirements defined – project announced – project engaged – inspection process(78)– project finished(no link) - changelist defined(place under 56 then connect to 3,5,6). **V Model Contractor:** Project approved – project defined – offer stated – project assigned – system specified – system designed – final design completed – system elements implemented – system integrated – delivery performed – inspection processed(11,13) – change list defined(5) – project finished. **Interface btw client & contractor:** Announcement – offer – contract – change in contract – project status report – delivery – declaration of acceptance – project completion report. **Organization specific model**: Project approved – project defined – process model analyzed – improvement to process model designed – improvement to process model implemented(3,6,7) – Change list defined(place under 5 then connect to 4,5) – change list finished. **Document:** Fundamentals, tour, V-Model-reference tailoring, roles, products, activities, picture conventions, part 9 templates, and part 8 appendix (Work of references, previous knowledge). **Rational Unified Process (RUP):** *S/W dev process*Customizable & extensible framework*Lang used is UML*Use-Casedriven(Use-cases are starting point and base for dev)*Arch centred(Sys is divided in components & subsystems thru the arch)*Iterative & incremental process. Dev consists of multiple cycles.Each cycle finishes with product release, i.e. after each cycle a pdt is delivered to cust. **Each cycle consists of 4 phases**: **Inception**(*Formulation of pdt idea,thevision*Specification of essential business use cases*Definition of project size)*Life cycle objective milestone)**Elaboration**(*Specificatn of pdt features*Architectural design*Scheduling of necessary activities & resources* Life cycl arch milestn)**Construction**(Pdt creation*Dev of architecture*Result:finished pdt*Initial operational capability milestn)**Transition**(*Pdt release to the customers*Examination of quality level*Delivery,training,service support, maintenance*Release milestn). **XP:** is a sw dev methodology which is intended to improve sw quality and responsiveness to changing cust reqs. Agile tech to deliver a software product. Lightweight methodology: **Rules:** Simplicity is key, Refactoring when & wherever poss, Code the test 1st(bug found create tests),use coding guidelines, Use Pair Progmng. **ADV of XP:**Suited for projs with unstable req, deliver high quality pdt,documents are minimized,delivery of working pdt, unnecessary work reduced to min. **DISADV:** Useful only for small/med proj,cud end up in chaotic situation,cannot use in safety critical proj, because it produces no or not enough docs.

CMM (Capability Maturity Model): A framework for s/w process improvement**. Purpose:** Eval level of maturity of s/w process in an org. It is a proof of qualification for s/w companies. It helps companies to improve their processes. **Adv**:*Performing these practices allows an org to improve its sw process capability.*Big client or projects can be acquired. **LEVELS: Initial:** chaotic process. **Repeatable:** Project Mgmnt is quite good but tech proc are chaotic. **Defined:** s/w proc in the org are well-def & are followed by co-workers. Thru such defined proc, the comp will learn abt diff proj in the org. Hence, its a future benefit to the comp. **Managed:** Org und the quantitative predictions and managing progress of the proj. Hence, process capability can be improved & evaluated quantitatively. **Optimizing:** Process Improvement grows continuously(Ex:By eval new tech). **Key Process Areas- (5)**Defect Prevention, Process Change Mgmt,Tech Innovation**(4)**Process Meas and Analysis,Qua Mgmt**(3)**Process Focus, Process Definition, Training, Integrated SW Mgmt, Product Engng, Peer Reviews **(2)**Req Mgmt, QA, Proj Tracking, Proj Planning, Subcontract Mgmt & Configuration Mgmt **(1)**None. **Prob OF CMM**: •No guaranteed interrelation btw high CMM-

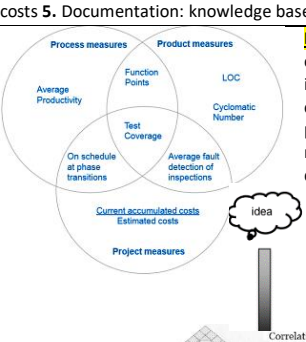
level & successful s/w production•Rather technology-oriented than staff oriented•Weak in level 4 and 5•Interrelation btw the questionnaire and CMM is not always visible•Model prescribes certain activities independently of their utility•To reach a high level it is necessary to meet all requirements of the lower levels• Not optimally appropriate for technical application areas•To reach a high lvl it is necessary to meet all reqs of the lower lvls. **CMM level Structure:** Maturity lvl(show->maturity of an org)->Key procs area(subdivided into->achv goals)->Key Prac Area(contain)->Key Prac(describe) [*commitment to perform*ability to perform*activities*measurement&analysis*verifying imple]. **CMM Integration (CMMI)–differentiates 22 Process Areas which are divided into 4 Groups**–(Proj Mgmt, Engng, Process mgmt, support). **Purpose**: to develop framework supporting a set of integrated models: (*dedicated to the s/w dev processes*for the acquisition of s/w*focusing on services). **CMMI goals:** 1)**Specific goals** describe what should be done to satisfy a specific process area. Should be achieved by conducting the processes related to the process area. 2)**Generic goals** are universally defined goals that apply to all process area. **2 types of Representations-Continuous:** any process area can be evaluated. A capability level for this process area is determined. Level 0: Incomplete 1: Performed 2: Managed 3: Defined 4: Quantitatively Managed 5: Optimizing. **Staged:** the cmplt org is evaluated. A maturity level is assigned to the org. Level 1:Initial 2:Managed 3:Defined 4:Quantitavely Managed 5:Optimizing **Low vs high stag mtrty:** (Improvised process, not always realised)(appropriate lived process), (reaction to prob)(avoidance of problems),(Functionality and quality reduction with time)(probs are predicted early & avoided),(cost projections not met)(better plan due to appropriate projection methods)

DIN ISO 9000: Purpose: family addresses "Quality management". This means what the org does to fulfil: cust qual req, applicable regulatory req while aiming to inc cust satisfaction, achieve continual impr of its perf in pursuit of these obj. **(PARTS: ISO 9000:** Defines basic defns and principles of QMS. **ISO 9000-1:** criteria's for choosing. **9000-2:** guidelines for appliance of ISO 90001/2/3. **9000-3**: guidelines for appliance of ISO 9001 to the specification, development, installation and support of software. **ISO 9000-4:** mgmt guidelines for reliability pgms. **9000-3:2004**: provides guidance to org in app of ISO 9001:2000 to the acquisi, supply, dev, op & maintenance of comp s/w). The app of **THIS is** for s/w that is-part of comm contract with other org, pdt avail for market sec,embedded in h/w pdt,rel to s/w services..ISO 9004: extend benefit from 9001 to parties interested in uroper. **ISO 9000(EN..) Series/DIN ISO 9000 Standards**: Standards for QA(***DIN EN ISO 9000:200S**: QMS-Fundamentals & vocabulary***9001:2008** QMS-Req***9004:2009:** Managing for the sustained of an org - A quality mgmt approach***ISO 19011:2002:**Guidelines for auditing mgmt sys***ISO/IEC 90003/90003:2004**-SoftEngng.Guidelines for the application of ISO 9001:2000 to computer sw). **Product Liability**: is the obligation to make up for a damage caused by a defective pdt. **DIN ISO 9000 Vs S/W Process Assesment: 1.** ISO 9000 is a fixed standard text. Concept: Follow a set of standards. Goal: Obtain and maintain level of certification. SPA has flexible CMM. Concept: Ongoing process of evaluating and improving. Goal: To continuously improve. Move from one lvl to the next better lvl. **2.** ISO 9000 is highly generic. Written for wide range of industries. SPA is specific to software industry. **3.** ISO 9000 reduces customer's risk for choosing supplier. SPA improve internal process to achieve higher product quality. **4.** ISO 9000's **benefits** are: customer relations, Market status. SPA's **benefits** are: savings due to process improvement – Costs of improvement = Benefit. **Why ISO Certificate:** *improved customer relation *high market status. **ISO 9000-3:** designed explicitly for applying to s/w or s/w based sys. It provides guidelines for the app of ISO 9001 to: spec, dev, installation& supp of s/w. It is certified according **to DIN ISO 9001**: the DIN ISO 9000-3 std is a reading aid • **DIN ISO 9000 Framework**: written for wide range of industries(highly generic). **Contents of ISO/IEC 90003: QA-System – frame** *Responsibility of the top mgmtt*Quality assurance sys, internal quality audits, corrective actions • **QA-System – life cycle activities** *Contract verification, determination of the requirements on the part of the client *Planning of the development, planning of the QA *Design and implementation, testing and validation *Acceptance, duplication, delivery and installation, maintenance• **QA-System-supporting activities** *Configuration mgmt, mgmt. of documents, quality records *Measurements, rules, methods & agreements, tools and techniques *Acquisition/provision, subcontractor mgmt, training]. **DIN ISO 9001 Vs S/W Process Assessment:** •**Subject**(Multitude of industrial org,pdts & procedures)(At the moment intended for pure s/w dev processes)•**Goal**(Proof of qualify for generation of qual-compatible res)(Detailed objectives and priority spec for the improvement of the process)•**Status**(Fixed de facto std)(Useful means for problem analysis & process impr)•**Basis**(Fixed std text)(Flexible CMM)•**REQ**(Minimal req)(Hierarchy of demands/reqs depending on level)•**Result**(Accepted certificate)(Actual state, strengths & weaknesses profile)•**Costs vs. benefit**(Benefit is founded by the given certificate)(Savings due to process improvements vs. costs for assessments) **Accredited certificate authorities:** [**DEKRA AG certification center, Stuttgart, Germanic Lloyd QA certification center, Hamburg, VDE inspection and certificate authority, Offenbach**] gives certificate.

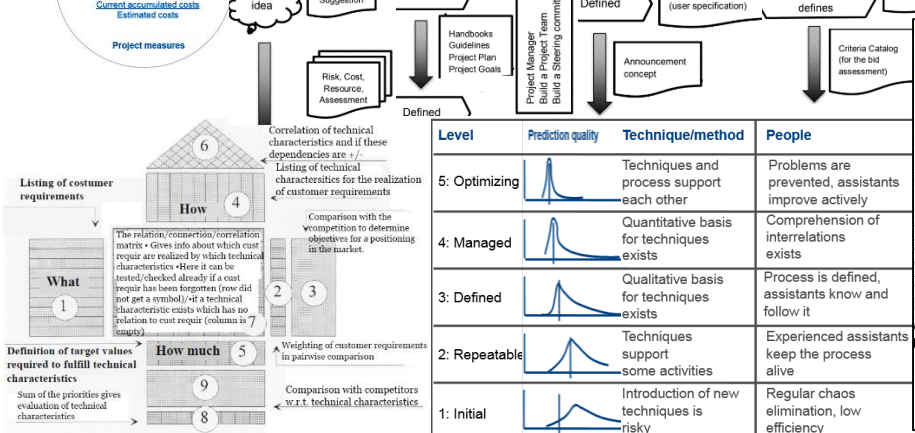
ISO/IEC 9126: Std for s/w qual focussing on s/w pdts. Quality model **Part1:**External & internal quality(*Functionality(suitability,accuracy,interoperability,security,functional compliance)*Reliability(maturity, fault tolerance, recoverability, reliability compliance)*Usability(understandability,learnability,operability,attractiveness,usability compliance)*Efficiency(time behaviour, resource behaviour, efficiency compliance)*Maintainability(analysability,changeability,stability,testability,maintainability compliance)*Portability(adaptability,installability,co-existence,replaceability,portability compliance). **PART2:** Quality in USE(Effectiveness, productivity, safety, satisfaction). **ISO/IEC 12207:2008-Process1**: Sys context processes r organized into 4 grps (agreement, organizational project-enabling, project, technical). **Process2**: Soft specific processes r orgnzd into 3 grps (implementation, support, reuse). **ISO/IEC 15504 (SPICE)** •International standard dedicated to the assessment & improvement of sw procs in an org. •It consists of 5 parts: •**ISO 15504-1:2004**-Concepts & vocab •**ISO 15504-2:2003** -Reqs to conduct process assessments •**ISO 15504-3:2004** -Support to perform proc assessments •**ISO 15504-4:2004**-Assistance on use of this standard for process improvement & process capability determination •**ISO/IEC 15504-5:2006** –An exemplar proc assessment model. [**12207:1995,** this standard defines 3 process categories with 9 process groups: **ProcsDiag: Primary Lifecycle Processes** (ACQuisition, SUPply, ENGg, OPEr)**Org LC Proc**(MANgmnt, PIMprocImprov, RINResource & infrastructure, REUse) **Supp LC Proc(SUPport)]**. **Assessments:** *Asses performed by evaluating chosen subset of 49 proc ***SPICE has 6 capability levels**(Level 0-5:incomplete,performed,managed,established,predictable,optimizing)*For each process, SPICE defines a *Purpose,* its expected *outcomes* & base *practices*. **(CoBIT)**Control Obj for Info & Related Technology: ***describes a widespread-controlling approach in the area of IT-*Governance**IT *Gov* ensures that the IT-structures & processes of an org r aligned with its strategies & goals(Business Alignment)**. ITIL**(IT Infrastr Lib): Quasi Std dedicated to manage IT services. It focus on production of services & not on sys dev. **Personal S/w Process (PSP)** is an improvement approach focused on performance improvement of single s/w developers.PSP organized as a self-improvement process (training prog) includes a series of exercises that each developer should do•PSP0–Baseline Proc•PSP1–Personal Planning Process•PSP2–Personal QM• PSP3 – Cyclic Personal Process. **AUDIT:** eval of person, org, sys, process, proj or pdt. Performed to ascertain the validity and reliability of information. **GOAL:** to expr an opinion on the person, org, sys in question, under eval based on a test basis. **3 types:** system, process, pdt. **Situation:** Interview of the auditor and employees of the (certificate owner) •1st party audit (intern auditor)->intern •2nd party audit (supplier audit)(customer auditor)->extern • 3rd party audit (certification audit)(3rd party auditor)->extern. **Quality audits:** are performed to verify the effectiveness of a quality management system. Are essential • to verify the existence of objective evidence of processes •to assess how successfully processes have been implemented • for judging the effectiveness of achieving any defined target levels •providing evidence concerning reduction and elimination of problem areas •are a hand-on management tool for achieving continual improvement in an organization. **CERTIFICATE:** given by external auditors of accredited certificate authorities. **Validity:** 3 years provided that period audits (usually every 6-12 months) continue to show compliance. **WHAT?** business companies, parts of business comp ,process for individual pdts. The company shows that its QMS meets the req of the sys(ISO 9001). **GOALS:** continously impr & find errors in the sys/process/pdt. **PROCEDURE:1.Preparation[***classification of the material affected by DIN EN ISO 9001*Identification of the prob areas*implementation of reqd modifications(*modification of prob areas*training of staff members,internal auditors*execution of internal preparation audits)] **2. Execution of certification:***info of concerned persons*monitoring of external certifiers **3. After the certificate is granted**(continuously): internal O-audits,reviews,monitor&reaudits,training. **S/W Inspection: Aim:** To detect faults efficiently & effectively. Done as defined Process. **Reviews: Aim:** Decision making, brainstorming, exchange of info, solving of conflicts. **Manual QA**: Comment technique (fast, cheap, flexible, low performance), Structured walkthrough (medium use of resources & moderate performance), Fagan Inspection (Expensive & time consuming but effective). **Team:** Moderator, Author, Reader, Recorder, Inspectors. **PHASE:** •Planning: Organisational prep•Overview: the author informs•Prep: every inspector prepares•Insp meeting•Rework: fault correction•FollowUp: Inspection of fault corrections. An inspection can b executed in every phase of soft dev(insp-of the reqs,design,src code,test case). Fagan ovrview source code line rate-500/hour, prep rate SC lines-125/hour, insp speed SC line 90/hr, insp peer-peer tech, insp results must not be used in personal evaluation.

Org of QA & QM: 1. TQM (Distributed QA responsibility, No independent QA) **2. Classical QA**(strict separation btw developers & testers, tester is respon for quality) **Roles:** Verification: Test whether input of a specific phase is transformed into the output without intro faults. Validation: Demonstrate that the product fulfils its requirements. Sys tester->analysis phase. Integration Tester->design. Module Tester->Implem. **Test doc&eval**: Tests have to be systematically planned,perf,cntrld,eval & documented. **QA plan**:•Measurability of qual goals•Criteria for req and results of each dev phase •Spec of test types•Detailed test plan, incl deadlines,resources, & permission authorities•Responsibilities. **Documentation** consists of: Test strategy•Test execution doc•Eval of test results•Failure/Fault description. **STANDARDS:**1)Process Oriented Stds-rules for SE&QA*Basically Org req*No technical req*Ex:ISO 2)Tech Stds: may b applicable to a specific app domain or spc typ of sys. Major SW comp use compromise btw TQM & CQA

QFD: A structured approach to define cust req. & translating them into specific plan to produce products to meet req. **Motivation:** Ensure• that the customer reqs enter the dev process as clearly identified reqs• That they are consequently realized there up to implementation details• That quantifiable, checkable target values are defined for developing on the basis of customer requirements• That it is possible to trace back every decision to a corresponding customer requirement• **Traditional approach:**• As few faults/errors/defects as possible• On schedule• High test costs • The product will be less bad. **Fundamental idea:** apply resources systematically in those positions which ensure fulfilment of most imp cust req. Translate VOC voices of cust or cust req into final product and/or service quality. **QFD APPROACH**• Preventive-oriented quality mgmt• Serving the purpose• Fulfilment of cust expectations. **Procedure:** (identification of cust req, weighting of cust req, Weighted customer req passed on to other sw dev process where they r handled & realized). **Goals:** •Working out of objectives for dev and QA based on cust req •Tracing of the realization of cust req thru all dev phases up to implementation details •Avoidance of too complex sw -> not user-oriented sw • Early identification of risks which are otherwise often detected during or after implementation phase• Reduction of dev time. **Benefits: 1.**Cust driven: focus: cust wants, not what comp thinks custwants."Voice of the Cust" drives the dev process, **2.** Competitive analysis: Other prods in marketplace r examined& comp prod is rated against competition,**3.** Reduced devtime: likelihood of design changes is reduced as QFD process focuses on improvements to be made to satisfy key cust reqs. Careful attention to cust reqs reduces risk that changes will be reqd late in project life cycle. Time is not spent developing insignificant functions& features.**4.** Reduced dev cost: Identification of reqd changes occurs early in project lifecycle. Minimizing changes following production reduces warranty costs & prod support costs **5.** Documentation: knowledge base is built as QFD process is implemented. A historical record of the decision-making process is developed.



House of Quality (HOQ): It is a graphical tool for defining the relations between customer req and technical req. **Goals:** Realization of the customer requirements in physical characteristics in consideration of important factors for the development process. **Cust Req Analysis:** 1)Seg of cus grps on the basis of dfrnt characteristics 2)indirect interview in the environment of future clients 3)direct interview with future users or with the aid of cust observations,e.g. concerning the handling of a prototype 4)info concerning pdcts already in use.(e.g. laud,prob,questions) 5)writing down of cust reqs thematically structured, e.g. according to probl,reqs,technical realization possibilities,charging of time & costs 6)cluster the cust reqs(*ignore connection to psbl realization possibilities*identify backgrounds for reqs*identify generic terms of reqs*subsume similar reqs) 7)statements abt the cust env(*who*When*where*why*what*how?) 8)listing of contents of the cust context table in consideration of their dependences 9)contents of the relation diagram & the affinity diag structured according to thematic levels.



Level	Prediction quality	Technique/method	People
5: Optimizing		Techniques and process support each other	Problems are prevented, assistants improve actively
4: Managed		Quantitative basis for techniques exists	Comprehension of interrelations exists
3: Defined		Qualitative basis for techniques exists	Process is defined, assistants know and follow it
2: Repeatable		Techniques support some activities	Experienced assistants keep the process alive
1: Initial		Introduction of new techniques is risky	Regular chaos elimination, low efficiency