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Aconcept of Technological and Managerial Complexity of Project Management in Khyber Pakhtoonkhawa, Pakistan.

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ABSTRACT
The*proposedresearchstudymainlydealswithproblemsassociatedwiththeConstructionEngineeringareasandtherefore themethodsaswellasproblemshavebeenselectedwith emphasisonapplicationsto Civil/Construction Engineeringtopics.Andalsoasnowadaysverypopular**ProjectComplexityManagementw.r.t.WaterManagement,**(PCM)**ispresented for today's challenges. In this study twomain Project Complexitytask s are described-the Project Complexity as a "management"problem and the Water Management as an"engineering"one.SeveralcategoriesamongProjectComplexityproblemsaredescribedandsomesolutionsfromtheProjectComplexityareaarecited.Next,anewclassificationforEvolutionaryProgress of Project Complexityispresented. It is based on the well-knownnotationdevelopedfor Project Complexity[David@all, 2000)andappropriately modified. Traditionally,the Project Complexities**(PCs)** are for single -objectiveproblems (SOPs) andnot for complicatedengineeringmulti-objectiveProjectComplexityProblems(PCPs).Solutionsforallthethreephenomena are presented: multi-objectivenature canbe solvedby Ladder approachof Nash forProjectComplexityapproaches,constraintsbypenaltyfunctionsanddifferenttypes ofvariablesbyanappropriateencoding. Severalotherpossibilitiesarediscussedinthetextaswell.*
Certain project characteristics provide a basis for determining the appropriate managerialactionsrequiredtocompletea complexprojectsuccessfully.Therefore,weneedtodevelopexceptionleveltechniquestoactressthecomplexprojects. Thestudyaimsasanengineeringexampleofasingle -objectiveProjectComplexities(SOPCs) problem, Water Users Associations (WUAs) of On Farm Water Management (OFWM)anditsuseforProjectComplexities&WaterManagement(PCs&WM)modelparameters

Prediction is presented in this study. A traditional method for WUAs training used herein is tilewell-knownBackgroundladdermethod,whichusesanumbrellabasedapproachof projectapplication and adaptation to the prevailing scenario and locale to minimize an output error. As anovelapproach,umbrellaapproachofcomplexprojectcanbeusedhereforthesamepurpose.Itis shownthat obtained errors are muchlowerthanthe outputs obtainedfrom the Backgroundladder method. Next, an identification of the integration of complex projects as in David model[David et al., 2000] it is investigated. This model is a fully three-dimensional approachof Linear,Horizontal and Vertical Project Complexities and Water Management at different combinationsof Project Complexities and Water Management along with the development of new model in tileshapeof LadderApproach.
The first main result is that the Complexities of Complex Projects Canbe solvedbyparallelanalysisin reasonable time and locale. The second outcomeis the fact that the localminima's ofthe identifiedproblems can be resolvedthrough UmbrellaApproachof ProjectApplication and adoption method as well as statistical analysis. This will also minimize the needoftrainingoflocalepeoplesforaWaterManagementProject'swork.

Keywords: *Project ComplexityManagementw.r.t. Water Management,(PCM wrtWM), TileProjectComplexities(PCs),Sing le -ObjectiveProblems**(SOPs),On**FarmWaterManagement(OFWM),ProjectComplexities(PCs), WU As, PCsWMmodel,LadderApproachof David&Nash.*

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I. INTRODUCTION

Theproposedthesismainlydealswithproblemsassociatedwiththe ConstructionEngineeringareaandthereforethemethodsaswellasproblemshavebeenselectedwithemphasisonapplicationstoCivil /ConstructionEngineeringtopics.AndalsoasnowadaysverypopularProjectComplexityManagementw.r.t.WaterManagement,(PCM)willbepresentedasone ofthe possiblewayshowto solvetoday'schallenges.In this studytwomainProjectComplexitytasksaredescribed-theProjectComplexityasa"management"problemandtheWaterManagementasan "engineering"one.SeveralcategoriesamongProjectComplexityproblemsaredescribedandsomesolutionsfromtheProjectComplexityareaarecited.Next,anewclassificationforEvolutionaryProgressofProjectComplexityispresented.It isbasedontitle

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Traditionally, the ProjectComplexities**(PCs)** are for single-objective problems(SOPs)andnotforcomplicatedengineeringmulti-objectiveProjectComplexityProblems(PCPs).Solutionsforallthethreephenomenaarepresented:multi-objectivenaturecanbesolvedbyLadderapproachofNashforProjectComplexityapproaches,constraintsbypenaltyfunctionsanddifferenttypesofvariablesbyanappropriateencoding.Severalotherpossibilitiesarediscussedinthetextaswell.
Therefore,thepresenteffortistohighlighttheseissueswithTechnologicalandManagementComplexities.Thedevelopmentalprojectsareinvariablycomplextherefore;thiscomplexityfromprojecttodepartmentneedstobestudied.
Ascertainprojectcharacteristicsdeterminetheappropriatemanagerialactions requiredforthesolutionofcomplexities,therefore,thepresent effortwilldeterminethesemanagerialtechniques.Anotheraimisthesolutionofengineeringsingle -objectiveProjectComplexityproblems such as WUAs of OFWM and it is use for a PCs &WMmodelparameters prediction ispresented in this study.A traditionalmethod for WUAs training used hereinisthe well -knownBackgroundladdermethod,whichusesanumbrellabasedapproachofprojectapplicationandadaptationtothepre vailingscenarioandlocaletominimizeanoutputerror.Asanovelapproach,umbrellaapproachofcomplexprojectcanbeusedhere forthe samepurpose. Itisshownthat obtained errors are much lower than the outputs obtained fromthe Backgroundladdermethod.Next, anidentificationoftheintegrationofcomplexprojectsI Davidmodel[Davidetal., 2000]isinvestigated. Thismodelis a fullythree-dimensionalapproach ofLinear, HorizontalandVerticalProjectComplexitiesandWaterManagementatdifferentcombinationsof ProjectComplexitiesand Water Management alongwith the development of new modelin the shapeofLadderApproach.The severedisadvantageoftheLadder Approach isitscomplication. Itcanbe reducedby setting appropriategoalsso ascanbe testedeasily. Next,aparallelversion ofthe adoptionofPC s-basedonthe alreadyidentifiedLadderApproachof David&Nashis directlyusedto obtainrequiredparametersbyvaryingthemwithina newprojectforcomplexityanalysisandadoption.

The first mainresult is that the Complexities ofComplex Projects Canbe solved byparallelanalysisin reasonable time and locale. The second outcomeis the fact that the localminima's ofthe identifiedproblems can be resolvedthrough UmbrellaApproachof ProjectApplication and adoption method as well as statistical analysis. This will also minimize the needoftrainingoflocalepeoplesforaWaterManagementProject'swork.

I. EXPERIMENTALTESTINGa.ProblemStatement

The study is for the diagnosis of the project complexity. It studies the comparative analysis of theprojects as in first world and its adoption in 3rd world. It is a work to ease the job of the projectimplementersintheundevelopedpocketsoftheglobeformaximization of benefits andoutcomes.

b.AimsandObjectives/ProposedSolutions

(1).Theaimsandobjectivesaretodiagnosetheprojectscomplexityofthestudy.(2).Projectapplicationandhistoricaldevelopmentofprojectcomplexity.
(3). ltsadoptionwithrespecttolocale,effectsandimpacts.

M.PROPOSEDANALYTICALMODELS&TECHNIQUES

a. Methodology:

Keeping in view the objectives of the study an attempt was made at preplanning stage todesign an applicable and workable research program. For this purpose all the relevant materialabout the project were

collectedand studiedfor the selection ofthe sample design and size, builtanapplicablequestionnaireandthe sampleareawassurveyed. The data collected throughdifferent methodswas analyzedfor data analysis throughtechniques such as simple randomsamplingmethod,**SPSS,**Primaveraetc.andfindingresultsanddiscussionofthestudy.

b. Samplesize:

It was difficult to study all the members/beneficiaries, therefore, 120 respondents fromeighteen representative components of the Project Area have been selected and then respondents wererandomlyselectedbyfollowingsystematicrandomsampling.Ineachsamplearea20%of

therespondentswereinterviewed.Inordertodecidethenumberofrespondentsthefollowingformulawasused;
NoofHouseholdsmoneoffice(samplearea) Y/Sample sizeof one sample area=NoofhouseholdinallsampleareasZJ SamplesizeofallsampleareasW
Y/X=ZJWX=(Y/Z) W
WhereW=SamplesizeofallsampleareasY= No ofhouse hold sin one samplearea**Z=** No ofhouseholdinall sampleareas
X=Samplesizeofonesamplearea

c. InterviewSchedule:

Forprimarydatacollectionaproperquestionnairewasdesignedwhichwaspre tested atIqra NationalUniversity.Afterpretestingitwasagainpretestedinthesurveyareaandwasreflected.Thedraftwasfinalizedand thentranslatedintolocallanguage/Urdufortileconvenienceofsomeoftherespondents.

d. Datacollection:

Withthehelpofenumerator,itwasexplainedtorespondentstogetthemintoconfidenceandinterviewed.

e. Dataanalysis:

ThedataweretabulatedthroughtaIe-sheetsandSPSSetcanddiscussionofresultswerefoundthen.

f. SourcesofData:

Sourcesof data were theavailablerecord in different provincial offices regarding title project.The other sources of data were that available on net, the review regarding the problem and titledatacollectionthroughquestionnaire.

IV. RESULTSANDDISCUSSION

A. Engineering

1. A model driven approach for cooperative work is necessary for water managementprojects.

For a model driven approach for cooperative work about 15.1 % recommended the new modelapproach.About25.5percentjust recommendit. So as awhole almost 40.6 percentoftherespondentsrecommendedthe driven approachandsatisfythe modelfor watermanagementprojects. Out of [06 respondents fifty- two respondents rejected the driven approach. About 8.5%respondents have no idea for this new driven approach. The average percent responses of all therespondentsareshowninFigure J.

2. The lead time of the project component is not the key indicator for efficient projectexecution.

As forthe leadtime of the project componentis not the key indicatorfor efficient projectexecution is concerned about 6.6 percent of the respondents strongly recommend the new modelapproach.About17.9 percentjust recommendit. So as awhole almost 24.5 percent oftherespondentsrecommendedthe driven approachandsatisfythe model for watermanagementprojects.OutofI 06respondentsfiftyfourrespondentsrejectedthedrivenapproach.About24.5% respondentshaveno idea for this new driven approach. The average percent responses ofalltherespondentsareshowninFiqure.2.

B. Management

1. Advancemathematicaltechniquesare preferredforprojectoptimization.

About 56.6% ofthe respondentsrespondedthatthe advancedmathematicaltechniquesarenecessary forthe new model approach, while 39.6 percent just recommend it. So as a wholealmost 96 percent of the

respondents recommended the driven approach and satisfy the model forwater managementprojects. Out of106 respondentsonly one respondentrejectedthe drivenapproach.About2.8%respondentshavenoideaforthisnewdrivenapproach.

2. Network Programming (weak, strong and hard) will be preferred for solving projectcomplexity.

As for the appropriateness of the Network Programming (Weak, Strong, and hard) for solvingproject complexity is concerned about 34.0 percent of the respondents strongly recommend titlenew model approach. About 59.4 percent just recommend it. So as a whole almost 93.4 percentoftherespondentsrecommendedthedrivenapproachandsatisfythe model for watermanagementprojects.Outof106respondentsonlyfour respondents rejected the drivenapproach.About2.8%respondentshavenoideaforthisnewdrivenapproach.

V. CONCLUSIONS

This study mainly deals with problems associatedwith the Construction Engineering area andtherefore the methods as wellas problemshave beenselectedwith emphasis on applicationstoCivil/ConstructionEngineeringtopics.TheProjectComplexityManagement wrtWatermanagement is presented how to face today's challenging project management problems. The twomainProjectComplexitytasksaredescribed-theProjectComplexityasa' 'Management"problem and the Project Complexity as an ‘‘Engineering” one. Several categories among ProjectComplexityproblems are describedand some solutions from the Project Complexity areas arecited.Next,anewclassificationforEvolutionaryProgressofProjectComplexityispresented.Itisbasedonthe well- knownota6ondevelopedfor Project Complexity[David@all, 2000]andappropriatelymodified.

The next part is devoted to the application of the presented PCs methods to the design ofWater Managementproblemsthroughanew system of Project Complexity Problems (PCPs)solutionin additionto the multi -objective integration and adoption domain in the shape of ladderapproachonthebasisofscientists(Nash,I995&David1999).
ThefirstmainresultisthattheComplexitiesofComplexProjectsCanbesolvedby parallellanalysisin reasonable time and locale. The second outcomeis the fact that the localminimasoftheidentified problemscanberesolvedtlhroughUmbrellaApproaclhofProject

Applicationandadoptionmethodaswellas statjstic alanalysis.Thiswillalsominimjzethe needoftrainingoflocalepeoplesforaWaterManagementProject'swork.

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NOTATION:

OFWM=OnFarmWaterManagement
PCPs = Project ComplexityProblems (PCPs)SOPs=Single-ObjectiveProblems
PCs&WMmodel=ProjectComplexities&WaterManagementWUAs=WaterUsersAssociations

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TABLESANDFIGURES
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Table1-Amodeldrivenapproachforcooperativeworkisnecessaryforwatermanagementprojects.

Status	Strongly Disagree	Disagree	NoDecision	Agree	Strongly Agree	Total
Frequency	32	22	9	27	16	106
Percent	30.2	20.8	8.5	25.5	15.1	100
Cumulative Percent	**51%Disagree**		**8.5% No decision**	**40.6%Agree**		100

Table 2- Theleadtimeofthe project componentisnot the keyindicatorfor efficientprojectexecution.

Status	Strongly Disagree	Disagree	NoDecision	Agree	Strongly Agree	Total
Frequency	22	32	26	19	7	106
Percent	20.8	30.2	24.5	17.9	6.6	100
Cumulative Percent	**51%Disagree**		**24.5% No decision**	**24.5%Agree**		100

Table 3-Advancemathematicaltechniquesare preferredforprojectoptimization.

Response	Frequency	Percent	CumulativePercent
StronglyDisagree	0	0	0.9%Disagree
Disagree	I	0.9	
NoDecision	3	2.8	2.8%NoDecision
Agree	42	39.6	96.2%Agree
StronglyAgree	60	56.6	
Total	106	100	100

Table4-NetworkProgramming(Weak,strongandhard)willbepreferredforsolvingprojectcomplexity

Response	Frequency	Percent	Cumulative Percent
StronglyDisagree	0	0	**3.8%Disagree**
Disagree	4	3.8	
NoDecision	3	2.8	2.8%Nodecision
Agree	63	59.4	**93.4%Agree**
StronglyAgree	36	34	
Total	106	100	100

Fig.I-Amodeldrivenapproachforcooperativeworkisnecessaryforwatermanagementprojects.

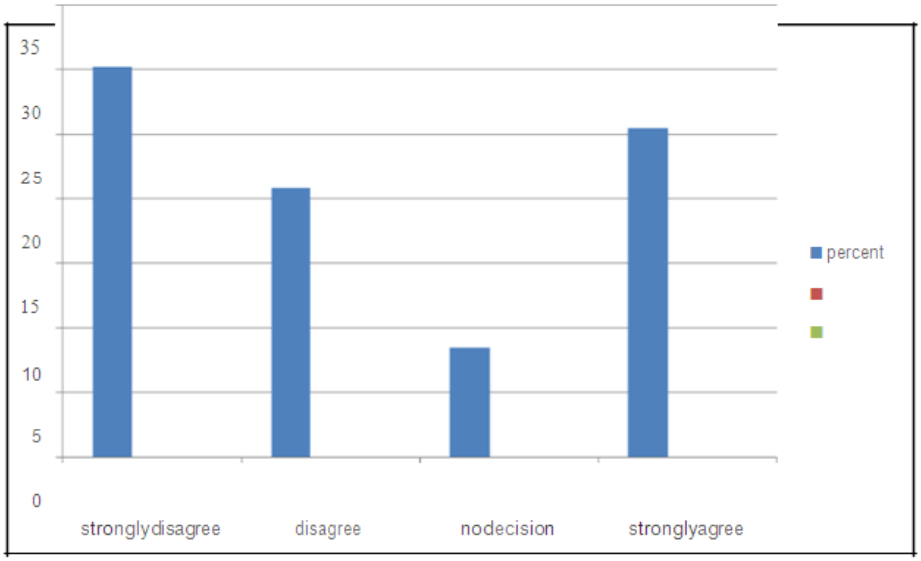

Fig. 2- Theleadtime of the project component is not the key indicator for efficientprojectexecution.

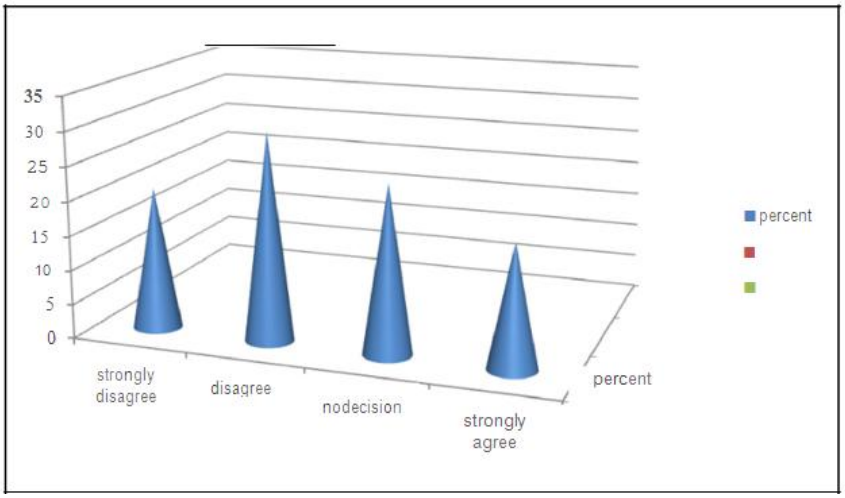

Fig.3-Advancemathematicaltechniquesarepreferredfor projectoptimization.

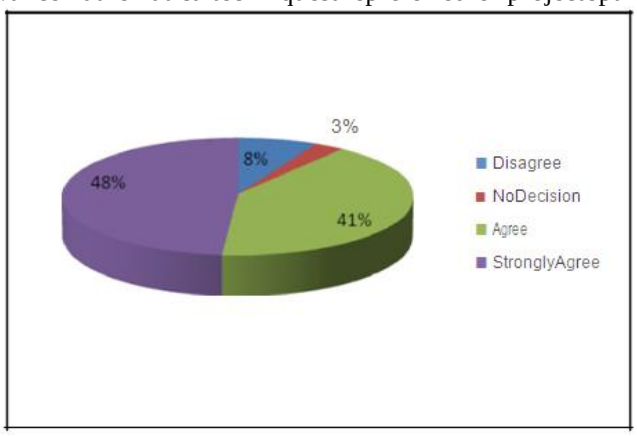

Figure3AveragePercentResponses

Fig. 4- Network Programming(weak,strongandhard)willbe preferredfor solvingprojectcomplexity.

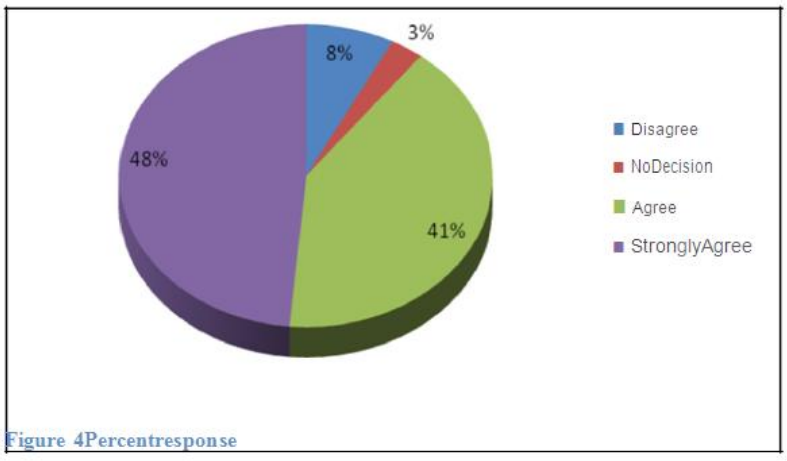

Figure 4Percentresponse