

,WHP 1DPH \$SSURYDO RI 5HJHQWV \*UDG WUBHUGLSFWIDYH  
0HWKRGVWBEOL, QGMSHQGHQW DQGD EOL  
&RQWUR ODULEDODI OXHQZ]RQH LQ \$ULJRQD

\$FWLRQ ,WHP

5HTXHVWHG \$KWLXQQ LYHUVLWLHV DQG WKH ERDUG RIILFH D  
DSSURYDO RI LWV 5HJHQWV \*UDG WUBHUGLSFWIDYH  
(VWDEOLVK WKH ,QGHSHQGHQW DQG 5H, QVQDDEOLQJRQWUR  
2]RQH LQ \$ULJRQD

%DFNJURGX+LVWRU\ RI 3UHYLRXV %RDUG \$FWLRQ

\$ULJRQD ODZ HVWDEOLVKHG 75,) IURP 3URSRVLWLRQ VW  
\$%25 WKH DXWKRULW\ WR DGPLQLVWHU WKH IXQG RQ WKH  
PDQDJHV DQG DGPLQLVWHUV WKH 75,) UHYHQXHV WKURXJK  
UHYHQXHV

2QH RI WKH RSWLRQLWV RZDZ ERDUG ,KDUHYHQXHVKWRXWKH XQL  
WKH UHFHQWO\ GHYHORSMSUSRFHQWV

7K\$XUSRVH RI 5HJHQWV

7K ERDUG RIILFH HQJDJHG ZLWKHSUWPHQWRIILFH  
WKHSDUWPHQW RI (QYLURQPHQ'WSDUWPHQW\RS]H'DOWK 6HU  
\$]'+6DQG 'HSDUWPHQW RI :DWHU 5HVRXUFHV \$]':5 WR GHY  
VWDWHPHQWV

7KXQLYHUNEML\$HVGIV LQSLURLEOHP VLQDWHPEUWRIDQG  
HQJDJHG LQ D 4 \$ VHVLRQ KHOG LQ -DQXDU\ WR DQVZHU I  
RUJDQLF FRPSRXQGV 92&V DQG ELRJHQLF YRODWLOH RUJ  
LPSDFW RU DVVLVW LQ WKH SURGXFWLRQ RI R]RQH LQ \$ULJ  
W\SHV RI FRQWUROV FDQ EH SXW LQ SODFH RU YROXQWDU\  
UHGXFH R]RQH DQG LPSURYH DLU TXDOLW\ %H\RQG WKH H  
PRGHOLQJ DQG DQDO\VLV \$ULJRQD QHGGV D EHWWHU SUHC

%RDUG RI 5HJHQWV 0HF  
\$SULO  
,WHP

(;&87,9( 6800\$5<

%RDUG RI 5HJHQWV 0HH

\$SULO

,WHP

3DJHRI

(;&87,9( 6800\$5<

FDQ WDNH WR UHGXFH R]RQH DQG LPSURYH DLU TXDOLW\ 7HDP

\$ULJRQD 6WDWHU 8QDLW WUKVIZW3D QIGD3LHUUH +HUFNHV 8QLYHUVLW\ RUV\$ULYRQDQD Q\$UPLQDQRURRVKLDQ

3URSRVDO 6XPPDU\

,QWHJUDWH PHDVXUHPHQWFKRPLRFJROHFRPSRXQDQWQWH DUW UHJLRQDO DLU TXDOLW\ PRGHO DQG VDWHOOLWH SUR FRPSRXQDQVEKQWHU VWDQG PR\$UQ]BQG B]RGLFRQFHQWUDV UHVHDUFKLWQDPVH D QXPHULFDO ZHDWKHU SUHGLFWLRQ V\ VLPXODQWVNUHDFWLYH SURFHVVHV LQIOXHQFLQJ WKH SURGX VROXWR]RQWHGDHRRQW DGGUHVVLQJ WZR NH\ FRPSRQHQWV U R]RQH PLWLJDWLRQ 0VDGY

%RDUG RI 5HJHQWV 0HF  
\$SULO  
,WHP  
3DJHRI

(;(&87,9( 6800\$5<

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&RPPLWWHH 5HYLHZ DQG 5HFRPPHQGDWLRQ

7KH 5HVHDUFK DQG +HDOWK 6FHMQHFWHG & WRELVLWHP DW LWV  
PHHWLQJ DQG UHFRPPHQGHG IRUZDUGLQJ WKH LWHP WR WH

6WDWXWRU\ 3ROLF\ 5HTXLUHPHQWV

\$ 5 6 † 37HFKQRORJ\ DQG 5HVHDUFK ,QLWLDWLYH )XQG´

\$%25 3ROLF\$GPLQLVWUDWLRQ RI 7HFKQRORJ\ DQG 5HVHDU

%RDUG RI 5HJHQWV 0HH

\$SULO

,WHP

3DJHRI

(;&87,9( 6800\$5<

,WHP 1DPH \$SSURYDO RI 5HJHQWV \*U\$QWJVR QDHSR MDU  
D&RV(WIHF W6RYCKWL,3G QWRL2S WQP DOORZ )

&RQWDFW ,QIRUPDWLRQ

&KDG 6DPSVRQ \$%25DG VDPSVRQ#D]UHJHQWV HGX

.HQ 3RO\$%R NHQ SRODVNR#D]UHJHQWV HGX

%RDUG RI 5HJHQWV 0HH

\$SULO

,WHP

3DJHRI

(;&87,9( 6800\$5<

PRGHOLQJ DQG DQDO\VLV \$ULJRQD QHHGV D EHWWHU S  
LQGSHQGHQW DQG UHVRQDEO\ FRQWUROODEOH YDUL

\$ULJRQD ZRXOG EHQHIIHFW WLRP D FRXWLRQ DQG RU RSW  
RSWLPDO IDOORZ ILHOG SORZWKDOW P&QXFWJHMPZLVQGR  
9DOOH\ )HYHU VSRUHV

1HHG FRVW HIIHFWLYH WHFKQRORJ\ WR UHPHQGH 3)\$  
D FRHFWLYH PHDQV WR UHSODFH FXUUHQW \$))) VXSS  
HIIHFWLYH ILUH VXSSUHVVDQW

\$ULJRQD QHHGV D FRPSUHKHQVLYH DVVHVPHQW LGHQV  
PLQH IHDWXUHV LPSDFWLQJ VXUIDFH DQG HUIXFWLZDWH  
VROXWLRQ RU PLWLJDWLRQ WHFKQRORJ\ WKDW FDQ OL  
ZDWHU DQG DLU

V \$KULSRQDQZAX@P ENKPPAWHVRQ DQVDFWDRPVF VHDWDELPH  
PXQLFLSDOLW\ VLJH 7KH VWXG\ VKRXOG GHWDLO UHF\F  
KLJKOLJKW SURV DQG FRQV IRU HDFK FRPPXQLW\ VLJH

7KH XQLYHUVLWLHV VXEPLWWHG WKHLDVSHURSRVDOV LQ UHV  
VWDWHPHQWV LQ )HE\$X'DDQDQ\$%\$'4UHWKHZHURSRVDOV

'SKRYE#XULQLOQ/XBQVDDHEDV HDE))H'ED'ES2XQVLIH ZHFG1 W``W3 S €  
DQ&A u p 0 U " € 0 D R Z

%RDUG RI 5HJHQWV 0HH  
\$SULO  
,WHP  
3DJHRI

(;(&87,9( 6800\$5<

)HYHU RQH RI WKH PRVW FRPPRQO\ UHSRUWHG LQIHFWRX  
7HDP

\$ULJRQD 6WDWH 8QLYHUVLW\ 'UV 0DWWKHZ )UDVHU 3LHU  
)HUUDQ \*3LUFK(ED.DYDJDQMLDQ  
1RUWKHUQ \$ULJRQD 8QDXUHLW\ 'DYLQ :DJQHU %ULGJHW %  
8QLYHUVLW\ RU\$ULJRQD KRRRQ #DOJLDQL

3URSRVDO 6XPPDU\

7RGHSOR\ V XVW PHGLDWHGE DQSLURG WHFKQRORJGMWLRQ IDC  
VXSSUHV V IXJLWLYH GXVW IRUPDWLRQ DQG VILFUVOLVDOVHRLQV  
PDQQHU WKDW LV VLP SOH DQG HYHQWXDOO\ DFWLRQDEOH

\$OVRRWKUHH \$ULJRQD 3XEOLF 8QLYHUVLWLHV KDYH WKH N  
QHHGHFRMRW DQG DQDO\JH WKH SK\VLFDQ PROHFXODU DQ  
PXFK GHXSGHUVWDQGLQJ RI WKH VRXUFH DQG WUDQVPLVVL  
D WDQJLSDRGHQV RI WKLV ZRUN ZLOO EH D JHRVSDWLDO P  
V\VVHVVZKDDWHUSURRWRW\SHPNDDQGHFRORWKDW ZLOO EU  
ZLGH YDULHW\ RI FXUUHQW GDWD RQ WKH VRXUFHV RI WKH  
LPSDFW LQ WKH VWDWH

:K\ LW 0DWWHU V WR \$ULJRQD

%ORZLQJ GXVW LV D VLJQLILFDQW XQGHUUDWHG KDJDUG LG  
GLVFLSOLQHV DQG VHFWRUV RI WKH HFRQRPI\ LQFOXGLQJ W  
TXDQLSRVXUH WR VXFK SOXU\$DFDQV FDQ DIIHFW ERWK OXQJ

%RDUG RI 5HJHQWV 0HF

\$SULO

,WHP

3DJHRI

(;(&87,9( 6800\$5<

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&RPPLWWHH 5HYLHZ DQG 5HFRPPHQGDWLRQ

7KH 5HVHDUFK DQG +HDOWK 6FHMQHFWHG & WRKPLWLVWHP DW LWV  
PHHWLQJ DQG UHFRPPHQGHG IRUZDUGLQJ WKH LWHP WR WH

6WDWXWRU\ 3ROLF\ 5HTXLUHPHQWV

\$ 5 6 † 37HFKQRORJ\ DQG 5HVHDUFK ,QLWLDWLYH )XQG´  
\$%25 3ROLF\³\$GPLQLVWUDWLRQ RI 7HFKQRORJ\ DQG 5HVHDU



%RDUG RI 5HJHQWV 0HH  
\$SULO  
,WHP  
(;(&87,9( 6800\$5< 3DJHRI

,WHP 1DPH \$SSURYDO RI 5HJHQWV \*U\$QWJRGDHSRVDO  
D&RVMIIHFVHLFKQRORSHPMBL3)W6H<sup>3</sup>)RUHYHU  
&KHPLFD&RQWDPLQDWHG

\$FWLRQ ,WHP

%DFNJLQX+LVWRU\ RI 3UHYLRXV %RDUG \$FWLRQ

\$ULJRQD ODZ HVWDEOLVKHG 75,) IURP 3URSRVLWLRQ VW  
\$%25 WKH DXWKRULW\ WR DGPLQLVWHU WKBRDQG RQ WKH  
PDQDJHV DQG DGPLQLVWHUV WKH 75,) UHYHQXHV WKURXJK  
UHYHQXHV

2QH RI WKH RSWLRQLWRRKZBRDUGS,KDUHYHQXHV WR WKH XQL  
WKH UHFHQWO\ GHYHORSMSURFJHQWV

7K\$XUSRVH RI 5HJHQWV LV WR DGGUHV DQG GHOLYHU VROX  
IDFLQJ WKH 6WDWH RI \$ULJRQD DQG LWV FLWLJHQV

7KRDUG RIILFH HQJDJHG ZLWKHSDUWPHQWRII\$GRLQLVWU  
WKHSDUWPHQW RI (QYLURQPHQ'WSDUWPHQWOWSK' (4HUYL FHV  
\$]' +6DQG 'HSDUWPHQW RI :DWHU 5HVRXUFHV \$]':5 WR GHY  
VWDWHPHQWV

7KXQLYHUVEMILSHVGTIV LQSLWRLEDOHP VLQWRMPPHGM/V RDIQG  
HQJDJHG LQ D 4 \$ VHVLRQ KHOG LQ -DQXDUWBLDQVWKH I  
SUREOHP VWSURFHSUREOHPV VWDWHPHQWV DUH

&XUUHQWO\ ZH GR QRW XQGHUVWDQG KRZ WKH XQLTXH  
&XED@EPCAPVGR S @

&RQWDFW ,QIRUPDWLRQ  
&KDG 6DPSVRQ \$%25DG VDPSVRQ#D]UHJHQWV HGX  
.HQ 3ROD\$%DR [NHQ SRODVNR#D\]UHJHQWV HGX](#)

%RDUG RI 5HJHQWV 0HH  
\$SULO  
,WHP  
3DJHRI

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\$ULJRQD ZRXOG EHQHILW WLFK QDQWLRQ DQG RU RSW  
RSWLPDO IDOORZ ILHOG SODRZWKDOW P&QXFWJHMPZLVQGR  
9DOOH\ )HYHU VSRUHV

1HHG FRVW HIIHFWLYH WHFKQRORJ\ WR UHPHQGHGWH 3)\$  
D FRHWWHFWLYH PHDQV WR UHSODFH FXUUHQW \$))) VXSS  
HIIHFWLYH ILUH VXSSUHVVDQW

\$ULJRQD QHHGV D FRPSUHKHQVLYH DVVHVPHQW LGHQV  
PLQH IHDWXUHV LPSDFWLQJ VXUIDFH DQG WWHXFOGLZDWH  
VROXWLRQ RU PLWLJDWLRQ WHFKQRORJ\ WKDW FDQ OL  
ZDWHU DQG DLU

\$ULJRQD ZRXOG EHQHILW IURP DQ HFRQRPLF IHDVLELO  
PXQLFLSDOLW\ VLJH 7KH VWXG\ VKRXOG GHWDLO UHF\I  
KLJKOLJKW SURV DQG FRQV IRU HDFK FRPPXQLW\ VLJH

7KH XQLYHUVLWLHV VXEPLWWHG WKH D SURSRVDQW DQ HPH  
LQ )HEUXDU\ DQG \$DQ \$%25 UHWKHZSR SRVDOV

'LVFXVVLRQ

%DVHG RQ WKH WKHFDZOW UJVLW\ SURSRVDOV VXEPLWWHG L  
3UREOHP 6WDWHPHQW DQG QD\ QHHG IIRUW YRWMFKQRORJ\  
UHPHGLDWH 3)\$6 3)RUHYHU &KHPLFDQV' FRQWDPLQDWHG

7KH ERIDWGVNHG WRDSYLRZHSGVHQQW )XQGLQJ WKH IROORZ  
SURSRVDQWVSRQVH WR WKLV SUREOHP VWDWHPHQW

&RQWH[W

2QH GURS BQGRSCHUIOXRURDON\O VXEVDQFHV 3)\$6 RU 3)R  
FRQWDPLQDWH PLOOLZDWDQORQVWRHGUQONLQPHQWDO  
\$JHQF&6 (3\$ HVWDEOLVKHG WKH KHDOWK DGYLVRU\ OHYHO  
QJ / EXW ZLGHVSUHDG XVLQJ RI 3)\$6 ILUH UHWDUGDQWV  
WKLV FRPSRXQG KDYH IRXQG WKHLU ZD\ LQWR LPSRUWDQW  
VRUEHQWV OLNH JUDQXODWHG DFWLYDWHG FKDUFRDO UHT  
UHJHQHUDWLRQ \$VORUGHGFWUBRSG LV RIWHQ LQFLQHGDWH  
5HDGLQJV DERYH (3\$ +HDOWK \$GYLVRU\ /HYHOV DUH LPSDF  
JURXQGZDWHU QHDOO DQVSRUWLQDQ LQ GULQNLQJ ZDWHU

%RDUG RI 5HJHQWV 0HH  
\$SULO  
,WHP  
3DJHRI

(;&879( 6800\$5<

7HDP

1RUWKHUQ \$UL]RQD 8QLYHUVLW\  
8QLYHUVL]RQD

3URSRVDO\_6XPPDU\  
QHZ P

7KH JRDO RI WKLW SURMHHFMMFLWLWR WUHFDFWRORFRFRWW UHPHG  
W\SHV RI 3)\$6 LQ ZDWHU 7KH DSSURDFK XVHV DGYDQFHG V  
PRGLLHG WR UHPRYH DOO W\SHV ZRIGH) \$D QURPRZDFRQD XWGR  
7KHVH VSRQJHV DUH FRQFRW WXFWYUUBPFGROZD EDWHULDOV  
FHOOXORVH DQG DUH UHJHQHUDEOH pK\SHeG DU0@P DD  
RpLPL]H WKH WUHDWPHQW V\WVHP 7H4°€0XQLYH`WLHV H[S

• FWLYH PHPI `WG HFRQLQD P3)Q\$W

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN

%RDUG RI 5HJHQWV 0HH  
\$SULO  
,WHP  
3DJHRI

(;(&87,9( 6800\$5<

,WHP 1DPH \$SSURYDO RI 5HJHQWV \*U\$OWJVRQDHSRVD  
&RPSUHKH\$VLMVP,SEOWL\$RLVHQWD PDUGR+XV  
\$EDQGRQHQHHDWX,PSDFWEXWIDFH DQG  
\*URXQGZDWHU

\$FWLRQ ,WHP

%DFNJQGX+LVWRU\ RI 3UHYLRXV %RDUG \$FWLRQ

\$ULJRQD ODZ HVWDEOLVKHG 75,) IURP 3URSRVLWLRQ VW  
\$%25 WKH DXWKRULW\ WR DGPHLQQLWVWVWKHHIXPGRKOI 7K  
PDQDJHV DQG DGPLQLVWHUV WKH 75,) UHYHQXHV WKURXJK  
UHYHQXHV

2QH RI \ WUÐPØ 0KH P °€0WKKH@ €`U

&RQWDFW ,QIRUPDWLRQ  
&KDG 6DPSVRQ \$%25 VDG VDPSVRQ#D]UHJHQWV HGX  
.HQ 3ROD\$%R NHQ SRODVNR#D]UHJHQWV HGX



%RDUG RI 5HJHQWV 0HF  
\$SULO  
,WHP  
3DJHRI

(;&87,9( 6800\$5<

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7HDP

\$ULJRQD 6WDWHU8Q15YIU VLDV\GHQ 5HEHFFD 0XHQLFK (ULQ  
&RQU\PHQHUU\ +DPLWRQ  
8QLYHU\$UW\RDID 0DUN %DUWRQ

3URSRVDO 6XPPDU\

\$ WKUHDU VWXG\ LV EHLQJ SGRSRVSHQLEEDU\PKHODPLRI HQJLQH  
ELRORJLVWV JHRORJLVWV DQG ULVN DFFHVVRUV WR L LC  
\$ULJRQD LL LGHQWLI\ SRWHQWLDO UIXNLQSRVHIGVNLLL U  
DVVHVPHQW IUDPHZRUN DQG LY FUHDWH PXOWLSOH ZRU  
QHDDQG ORHUIP PDQDJHPHQW

:K\ LW 0DWWHUV WR \$ULJRQD

'HVSLWH WKH JUHDWHU WKDQ \HDUV KLVWRU\ RI GHYHO  
WKHUH LV QR FRPSUHKHQVLYH GDWDVHW WKDW SURYLGHV  
PLQLQJHODWHGVIKHWXVRS HQJLQJV ZDVWH DQG FRQWDPLQD

%XGJHW

\$QQXDO

7KLV SDJH LQWHQWLRQDOO\ OHIW EODQN







%RDUG RI 5HJHQWV 0HF

\$SIUO

,WHP

3DJHRI

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3URSRVDO 6XPPDU\

7KH SURFRIDDERUDWLYH SURMHFW ZLOO SLORWQWHVW KXE  
 \$ULJRQD FRPPXQLWLHV YDOLGDWHG ZLWK IRXU VFDODEOH  
 WR HYDOXDWH WKH HFRQRPLF LPSDFW RI UHF\FOLQJ LQ \$U  
 SURYLGH YLDEOH ILQDQFLDO VFHQDULRV IRU LPSOHPHQWL  
 \$ULJRQD 7KH PRGHV WRROV DUH \$Q \$ULJRQD 5HF\FOLQJ  
 DPRXQW RI UHF\FODEOH PDWHULDO DYDLDEOH LQ FRPPXQ  
 GHPRJUDSKLFV 7KH \$ULJRQD 5HF\FOLQJ (FRQRPLFV ,QIRUP  
 HFRQRPLF LPSDFW RI UHF\FOLQJ IRU WKH 6WDWH RI \$ULJRQ  
 OHYHO \$ &RVW %HQHILW \$QDO\VLV PRGHO WR HYDOXDWH V