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[NG V T NOGU PG" [" PGNUYULMA@NCU[
D T" DCPMC" WDGU " " TPG

BURCU D TUGP

Nisan 2022

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Reowmme ng " ©pkxgtu
Uqu{ cn" Dknkongt " G
Doktora Tezi
ng Cp g " Dknko " Fc
I g p g n " Doktoga Pto g i" t c o ,

Dwt ew" D TUGP

Fcp, ocp < " Fq ±W' Ft 0 " C{ gi Ñn

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FGP N\

D w " v g | k p " v c u c t , o , . " j c | , t n c p o c u , . " { Ã t
d w n i w n c t , p , p " c p c n k | n g t k p f g " d k n k o u g n " g v k
d w " ± c n , o c p , p " f q t w f c p " d k t k p e k n " Ã t Ã p Ã " q n
bilimu g n " g v k g " w { i w p " q n c t c m " m c { p c m " i c ³/₄ u, v h g y t c k'
d w n w p w n f w w p w " d g { c p " g f g t k o 0

o | c

Burcu B T U G P

“ PU ” \

Bu tezin hc | , t n c p o c u , p f c " d k n i k u k p k " x g " v g e t / f g u v g m " q n c p " f g g t n k " C f { c p g , i Ñ m c " p V W j q ' e d c c o " v F e d ' ± q 0 n ' u c x w p o c " l f Ñ g t k g " t Ñ { k g " R j t g q t k c 0 n " c F t t , 0 o " , C f n q k ± " " F \ t F O G ' O G u T t c " C A D A L I , P r o f . D r . H a k a n S A R I T A " x g " R t q h 0 " F t 0 " O w j u k p " " \ F G C v g g m m Ñ t n g W { k i o k n ' a u o w p " c d ¾ n o Ñ o Ñ p f , g ' c " j g t " | c o c p " u c e v a p v e r e r e k d c p c " { q n f p ö F , q ± 0 " F t 0 " Q n e c { " R Q N C V " j q e d e r i m .

U Ñ t g ± " p g " m c f c x t g " t | f q k t u k c " m d g c { k c h t " , f p g , " p d E k k v k ö ñ c x g " ¾ t g v k b u ñ j z o r l u v e b i r o k a d a r p l a k e y i f l i f q m v q t i c u Ñ g t n d e k b a k o q n c p " i j Ñ k g d p k t p k y b e t n e y e n p g x i k f k F g ' 0 k ' Q p w t " D T U G P ø g k " j f e m k , " o d c c e t v , m , c n t c , t o , f " c ± q m m " d Ñ { Ñ m " q n c p . " j a r k a m d a d u r a r a k b e n i h e r z a m a n d e s t e k l e y e n , s e v g i l i a n n e m S e r i n D C V G M e H a b a m M e h m e t A l i D C V G M g P g x i k " x g " v g g m a n Ñ t k p g k t " k x o g k " ± u c w p , c t ¾ t p g m " c n f , , o " e c p , o " m c K A Y A L A R , o x c G d n t , w n ' n c F t C , ' g p g t l k n g t k p f g p n " f j , s e v g i l i b o q " c w o n c n p c " t i , Ñ ± " G h g " , x i y k i R q { t c x c t u , p , |

“ \ G V

J \ O G V " U G M V " T © P F G " D G M N G O G " J C V V K " U
[N G V T N O G U P G " [" P G N U Y M U L N M A S E N C U [
D T " D C P M C " W D G U " " T P G

B T U, B R c u

Doktora Tezi

n g v o g " C D F

I g p g n " F q m g q t o g " R t q i t c o ,

F c p , < ö F p ± 0 " F t 0 " C { g i Ñ n " V W

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n g v o g n g t k p " m Ñ t g u g n " t g k i n d k g v ' j k " { o g t v " d ñ 4 q
q n w o v w t e t e k m e k t e d i r . J k | o g v " u g n i v p 3 / g t o Ñ n " k k " ± d k k p t f " g { " g , t p k " q n c
rekabet edebilmeleri k ± k p " 3 / 4 p g o n k " i 3 / 4 t g g m g g k p f j p v d k t k k
k { k n g d i k D g o r m g g t k " j c v v , " u k u v g o m e g t p k p n k e ' t k { p k ' n g
g m k n f g a r a k n d v g n m r c g o , g " n o Ñ Ñ o g m Ñ g t ' k o r k a f z a l v o a u , d p e c n , f , t 0
B w " g m k n f i n g " x g " o k Ñ , v g g t v k n ' k p f c d u k u l a r a k j m Ñ o v g g v t k
memnuniyetin f g " c v t o v Ñ v g t i l g i l i b a r k a k k p n " g " ± c n , n o , c m c c n ' , f t e g x c o
D w " v g | k p " c d e g e ' , h . c ' b i n d k p b i r b a n k a 3 / 4 w d i g t i t b o k l e m e
j c v v , " u , l o Ñ v g y o g t p k ' p x i g k t t k f n k g " t d k r p c k t c s i o " Ñ m v e n a r ' c f p e , { n c f n ,
o q f g n n g t e r e k i k g i n k n g v p k k ' t k n o g D k p m p ; 3 / 4 p o e l g p ' k m n g " o g
f w t w o w " { c p u y g m p i n t u k f g e g * ± c n , o h i z m e t k u y r u k m n Ñ Ñ
disiplini ile bir model q n w v w t u r w D a l a w o n r a d g " m t k v g t " * ± c n , o
u c f e m e v . " { c . " ± c n , o c " f w h i z m e t k u y r u k g d i s i p l i n i n e g o " u Ñ
bir senaryo ve belirli bir kuyruk u , p , v t n , e p c , n f f 3 / 4 t f , Ñ p f e Ñ " d e p m q p w p
bir senaryo k ± k p k " h c t m n w , " v o w t f w g a r e h a q 1 4 0 0 v t a k t e t r t q i t c o , " k
bu modeller u k o Ñ n i p ' m Ñ f k g t k n g t k p " m w { t w m v c " d g m n g o
m e r u c o , p f e m k " m c { p c m n c q t , p p ' n k e d { f o c , j n g - Ñ c m v g u t p k c ' p
memnuniyetini artv , n t e n u y g u n v e e n e t k i l i m o d e l v g u r k v " g f t k , n e o d k " v l
i Ñ p Ñ o Ñ | Ñ p " g p " d Ñ { Ñ m " r t q d n g o k " E Q X K F " 3 ; " r c p f
c o c i t e y e n i b i r m o d e l k u r u l a r a k t e z e f c j k n " g f k n o k v k t 0

Anahtar Kelimeler: D g m n g o g " J c U k v o , Ñ n U c k ' u u D v a g p p n k . e , n , m " U g

ABSTRACT

SIMULATION APPLICATION TO IMPROVE WAITING LINE SYSTEMS IN THE SERVICE SECTOR: THE BANK BRANCH SAMPLE

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Businesses have to create effective service management in order to take part in global competition. One of the most important tasks of banks, which have an important place in the service sector, is to improve their waiting line systems in order to compete. The improvement of waiting line systems depends on reducing waiting times as much as possible by using resources efficiently. In this way, an increase in customer satisfaction and the continuity of the customers to work with the relevant bank are ensured by providing a fast and customer-oriented effective service.

The aim of this thesis is to improve waiting line system of a bank branch operating in Denizli by developing simulation-based models in which customer data of the branch is used as input. For this aim, firstly the model with only one criterion (working size) priority queue discipline that reflects the current situation has been developed. Then, the two different models have been developed for the scenario with five criteria (working size, loyalty, age, working status and processing time) priority queue discipline and the scenario in which the fourth counter is opened when a certain queue limit is reached. These models have been simulated with the Arena 14.00 package program and customers' waiting times in the queue and useful usage rates of the resources within the scope of the service have been calculated. Then, the most suitable and effective model that increases customer satisfaction has been determined. In addition, a new model has been established and included in the thesis in order to see the impact of the COVID 19 pandemic period, which is the biggest problem of today.

Keywords: Waiting Line System, Simulation, Banking Sector

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3 0 7 0 4 0 " U q p u w " M w { t w m " M c r c u k v g.n.k."...¥3q m " M c p	3q
3 0 7 0 5 0 " U q p n w " M w { t w m " M c r c u k v g.n.k."...V.g3m " M c p c	3m
3 0 7 0 6 0 " U q p n w " M w { t w m " M c r c u k v g.n.k."...¥.q3m " M c p c	3m
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U O I G " X G " M K U C N V O C N C T " F \ P

VZA	Veri Zarflama Analizi
AHS	C p c n k v k m " J k { g t c t k " U Ã t g e k
FIFO	n m " I g n g p " Kuyruk Disiplini (First In First Out) "
LIFO	U q p " I g n g p " n m " J k o g v " C n , t " M w { t w m " F
PRI	" p ilk Hizmet Kuyruk Disiplini (Priority Queue Discipline)
SIRO	Rastgele Hizmet Kuyruk Disiplini (Service In Random Order)
O [O Ã v g t k " n k m k n g t k " [g v m k n k u k
O C	O Ã v g t k k " m k n g t k " C u k u v c p ,
P	R q t v h $\frac{3}{4}$ { " O Ã v g t k u k
M	M k v n g " si O Ã v g t k
H	J c x w " O Ã v g t k u k
S	U c f , m " O Ã v g t k
	U c f , m " Q n o c { c p " O Ã v g t k
Y	[c n , " O Ã v g t k
G	I g p ± " O Ã v g t k
C	¥ c n , c p " O Ã v g t k
	¥ c n , o c { c p " O Ã v g t k
U	W w p "
K	M , u c "

I T

Bireyler, j c { c v n c t , p , " f g x h c c o t m a l h a r a v e k j t k g d o k g n v o n g g m " g k ' k k
duyo c m v . c f j , v t k { ± c g ± n k c v t n g p g , t t e g m l ö j i n i n , h i z m e t z i n c i r l e r i n i n v e
w n w u n c t c i n f g ; " i g k k k c o n g g v , k b i r e y l e r i g " k j v k { c ± " Ñ f Ñ p f i y t k v
Ñ g v o g m " k ± k p " d Ñ k t e Ñ r o * g U m v t g " q x g) . " R e k g b e f i k 2 3 0 v i v Ñ p Ñ o Ñ | "
v q r n w o w p f c " j , | n , " x g " g d u c p g e n t " , f { c , x " t { c e p n e H i z m e t { g e p d " k k n
kalitesini arttı, t c p " k , t n c g n v k o r g n g g t k p g " m e t , " o l u k p e n g h o z m e k " c x c
kalitesini arttı , t c o c { c p " k n g v o g k n g g " " k Ñ | g " " o Ñ | B e k l e m e d e k n ' o m c n e
j c v j k , | . o g v " m e n k v g u k p u r s u ß l a g d a n m i k i d i r g { k g h p v " ± g k p F " 3 4 { p e g " 0 8 x < k "
[, n f , | 2) . " 4 2 4 2 <

J k | o g v " c n o c m " k ± k p " i g n g p " o Ñ v g t k n g t k
{ g v g t u k | n k k " p g f g p k { n g " | c o c p , p f c " m e t , n e p
d k t " d g m n g o g " r t q d n g o k " q n w v w t w t 0 " O g e y a f c p c "
ö m w { ö t . w m t k d g g ö g d g m n g o g " j c v v , " r t q d n g B k ö " x g
{ ¾ p f g m k " ± c n , o c n e t c " f c " ö d g m n g v e g i l i r (Y g x k m " x g ö
Yazgan, 2008: 120). D g m n g o g e b r i ş i , c d v g m , n " g o g ' t g d n g o k p g f . ± ¾ | Ñ
D g m n g o g " j c v v , " v g q t k u k p f g " c o c ± . " v c n g d k " m
c t v v , * G n m i v ¾ | 5) . " 4 2 3 5 <

B g m n g o g " j c v d k t ' d r k t t q k d { n n g o o ' l a r a k g i k i u " g n k m e y f l a g a , n , "
i g n o g m v g f k t 0 " V c n g d k p j " k e | t o v g o v e " u c , n ' o u c q n p " w k e ± w k " p o " Ñ d g v n
q n w c d k a n d a t a g e m ' v g " c n h i z m e t b i r i m l e r i n v k a l a b i l m e k t e d i r . F q n c { , u , { n
talebin { Ñ m u g m " d u r u m f a r d a , b e k l e m e m a l i y e t i a r t a r k e n v c n g d k p " f Ñ Ñ m "
f w t w o n c t f c " h i z m e t m a l i y e t i n a g m a m v g p f k , p t e b i b e l i s i z l i k n e d e n i y e
m c ± , p , n o c | " a l i h i z m e t f Ñ " g ö { q k r ö v " k d g n k t n g o g " r t q d n g o
Optimal hizmet f Ñ | g { k = " o Ñ v g t k n g t k p " m w { t w m v c , " n d g m
m e n o c u , " c t c u , p f c m k " n h i z m e t i f g Ñ | g d (N a f e e s , u 2 0 0 7 : , 4 " u c n
Priyangika ve Cooray, 2015: 42).

O Ñ v g t k n g t c k p e ' b e k l e n t i l e r i n e o p t i m a l j k | o g v " i l e f c Ñ v a p g { k
verilebilmesi; kalite, maliyet ve | c o c p " d k n g v n g k p m " g d k t p ' k p k ± k o f g "
o Ñ o m Ñ p " q n c d k n o g m v g f k t , Q l " w ' D w " o p e f ' g p { n ¾ g " g k k m " g v
matematiksel { ¾ p v g n o w n g n t c k p o c { c " { ¾ p g n a o k n v g k t f o n k t u v 0 " o g [n ¾ g p t
elindeki m c { p c m n c t n , p f Ñ m v n k f o g p d a , n g a t u k , o n k n k r i d a p " c t v

maliyetlerin en aza indirilmesinde, o Ã v g t k " onıno yewşadakatıgıv k
u c n c p o c u , p f c " { ¾ p g v k e k n g t Y¾ p g { c u t f e , " o v e , t " o c u
{ ¾ p v g o n b k t e r k e p h d v t e p r i s i , d w " p g f g p n g " n k v g t c v Ã t p g p i ğ
sahiptir (Hillier ve Lieberman, 2001: 810).

Bankalar, d g m n g o g ğ ğ i t c k v w k p k p " ¾ p g o n k " w { i w n c o c " "
" | g n n k m n g " p Ã h w u w p , " h i z m e t a l m a k k a d a p d m c w " " Ã v b e k l e m e g g t t k f p g f
durumu, w | w p " { , n n c t f , t " u Ã t g i g n g p " d k t " r t q d n g o
r g t u q p g n t v u t o c m , " p q h e m q n c { " q n c o c { c e c , " k ± k p
d w " r t q d n g o k p " m , u c " u Ã i ¾ f ğ h o ğ o H a o n v ¾ Y i f e , 2 0 1 1 " . * g " o /
640). D g m n g o g v " g j q t k v k " { c t f , o , , b k j k | d g v , o n a g p n v ¾ t p
d c p m c n c t , p " w d g n g t k p f g " w { i w n c o c k f o Ã , p ğ t k " o
memnuniyeti u c n c p c d k n g e g m v k t 0

Bu tez ±c n , u d a p ¾ p e g h i z m e t k u y r u k d i s i p l i n i i l e h i z m e t v e r e n b i r b a n k a

w d g a k p ' g o Ã v g t k n g t n i k v e h i z m e t g e s m a n g p e r s o n e l i n Ã v u g Ã n t g g t n k g t k p
o k p k o w o c " k p f k t g e g m " m c r c u k d v k n " k f o Ã u | g g n { " k o k t " d { g ¾
bekleme j c v v , k n g ' q p d , g e k b u d n c , p m c " d v g m n g o g ' ğ ' j c v v , " u k
k { k n g v k t k d g m n g o g q " f j g ¾ p n g n t k m " k a n a l i z l e r k u " k { o c , r n , o n u { q p "

¥ c n , i k o t c k " " x g " u i ğ p v k t ± " d d ¾ m Ã o n f g g t p " q n w o c m v c r
d g m n g o g " j c v v , " v g q t k u k . " d g x n g n " g ¾ | g g ' n j n c k v m n , g " t u k k " u
bekleme j c v v , " o q f g n k . " o q f g n k e p m " w d k n g , g p p e ğ t f k c . " ,
c n o , , p v , t 0

m k p e k " , d d g ¾ m n Ã g o o f g g " j c v v , " u k a n a l i z i d e n i l g i l i b l g i f e g " u k o
{ g t " x g t k n o k m v k t o ' b U k o ' Ã k o u Ã h q p { q p o v p ç t a p h s e g t n n k m
i g n k u k k o Ã n v " Ã t { m p t " k " x g " u Ã t g e k p f g p " d c j u g f k n o k

© ± Ã p e Ã " d ¾ n Ã o " q n c p " ; F v g { p i k w | n n c k o " c k ' n d k ¾ m f Ã g o " Ã l p d g n
k c o w " d c p d n c t u " , p a i t p o ğ l a n k p v e r i l e r k p e g n g p o k v k b e k l e m e n i k n
u Ã t g i m g g t n k k p g k n n g o g e o r i s i d e a n a l i z e d i l e r e k u k o Ã n o v t { o p c o c u ,
{ c o , n D g m n g o g " j c v v , " u k a o g i l e k e p c k t p u r u k v e k l t e r n a t i f v k t k n
u g p c t { q n c t " k d ± g k m p n " g o p n m o d e l l e r i n i n v d , g c n p ğ o g " u k Ã y n a ğ n g t k "
m w n n c p , o c " ± q , t u c , u p p n f e c Ğ p n " c { u c { r q , p n w c " t c m d ' g g m p n " g w ğ n i o d e j l p c " v v ,
d g n k t n g p o k d . g " m k ğ k g ğ j v x k g t v ' k u l ' g u p k p u c v n g k o | k " " C f { k n e k " v

D T P E " D " N © O BEKLEME HATTI V G Q T U

ngvogngt k p " m c t , n c v , , " r t q d n g o n g t k
mq w n n c t , p " f k m m c v g " c n , p o c d u g m m x g g p' g g m " x u g q p k w m n k c
g f k n o g u k " m B u n d u r u f n d a f e n g i y i k a r a r f a l t e r n a t i f e w n c c d k n o l g k l a " k ± k
d g n k t n g p g p " r t q d n g o k p " u c r f , c m n d ' k ' n c k p o c u n g k n | " k { ¾ p
h c { f c n c p M e n t o o c p r o b l e m l e t i n 0 ± ¾ | Ñ o Ñ " i z i l g ± ¾ p p " g n a t g o " v ; t o c u
d k n k o u g n " d ¾ p ± v e c t a n k l e r i k m w n n c p o D m v c f f w t t w o . " { ¾ p
c t c v , t o c u , p , p " ¾ p g o k p k " q t v c { c " m q { o c m v c " x
d k n k o k " q n f w w p w | v 2 0 1 0 : 5 - 9) . f o g m v g f k t "

Y¾ p g { a t g o " v , b e n k t n k " m , u , v n c t " c n v , p f c " c o c e
d w n w p o c u , " k ± k p " i g n k o l u p k a t a r k v e r i c i n k n { ' c { ¾ p v y g o n g t g " d
q n o c u , p c . " f c j c " k { k " m q p v t q n " x g " g i Ñ f Ñ o " u c
x g " f c j c " k { k " m c t a t m (i t ' v Ñ g m 9 ; G u k i p 5 " w 6) . C V 2 m , ; " e c
c p c n k v k m " { ¾ p v g g u n g k k " m f w k m g p p " c t t a d n g o g " ± ¾ | Ñ
v c o c o g p " q t v c f c p " m c n f , t , r " o g x e y e r i n e g e n e l t b i w o w p "
d c m , " c ± , u , " u c n c { c t c m " g p " w { i w p " m c t c t , p "
{ c t f o l u r (W i n s t o n v e G o l d b e r g , 2 0 0 4 : 1 2 ; I t t m a n n , 2 0 0 9 : 9 0 - 9 1) . D g m n g o g " j c
teorisi, y¾ p g { n g o " , c p f c v m w n c a p , n c p " { .¾ p v g o n g t f g p "

[¾ g { n g o " c t c v , t o c u m w p f t c w n d a g " a n d i n g o t g d n j " t c , v n o c
M w { t w m n c t . " j k | o g v " v c n g r j g f g p v ö Ñ c v g t k ; a c {
{ c " f c " k n g v o g p k p e d e n i y e t v e r i t e m j k k | ± o c g n v , k p o " c ¾ o p c i u ¾ t Ñ n g p
uzunu Ñ t a u g u p k w e w " q n w . , 2 0 1 4 : " 1 4) . D e c p m n d ' k " w d g n g t k p f g . " o
hastane ve restoranlarda q n w k u y r u k l a r a u , m t a u m n c p (W a g n e r y 1 9 7 5 : , 1 2) .
C { p , " g m k n f g " d k t " Ñ t g v k o " k n g v o g u k p f g " o q p
d g m n g { g p " o c m k p g n g t . " k u y r u k l q t n " w k ± v k w p t " o d c g m v n c g f { , g t p 0 " " c
f g " c p n c , n c e c , " e Ñ | " g d k g t " g d g n n k o p g ' . i " Ñ p a f Ñ g n " j c
faaliyetlerinde de m c t , n d u r u m d u r (H w a n g v e C o h c a t o , 2 0 0 4 : 1 0 9 8) .

V k o g " f g t i k M o k r o p k (1 9 8 4) ; b e k l e m e d u r u m u n u , ö D g m n g o g " d k t "
j c r u q n w v w t 0 " D k t " m k k . " d c m e u , p , p " g v m k p " c
| q t n c p o c m v c " x g " j c m u , | " { g t g " e g | c n c p f , t , n o
d g m n g o g " f w t w o w p f c " d k t " m k p ' k p d m " ¾ p g ö g k ' g d k k "

| c o c p , " ± c n , p o c m v c f , t 0 ö " g m n k p f g " :k85)c f g " g
F q n c { b g u m n { g n o c g p k p " j g o " u Ñ t g u k " j g o " f g " p g f g p k .
q n o c n , f , t " *6P. q t o c p . " 4 2 2 : <

V g m p q n q l k m " i g n k i Ñ o p Ñ o g Ñ t d k e p n j g g o p g m d o Ñ f Ñ m " , ö c n
q n w v w t c d k n o g m v g f k 4). D g * r c m g u c g " c d m c { , x . f " 0 g m ç p 2 ç a
¥ Ñ p m Ñ " d g m n g o g " u Ñ t g n e , k v " " d q n { c w p p " e ö c | " c v o Ñ c m p g ö v " k m c k { n p g c t
C { t , e c " d g m n g o g " f w t w o w p u f Ñ t " g v Ñ d n g m v n k g e { k g p e k g p " k p g
d g n k t u k | n k m . " d g m n g o g p k p " c f k n " q n o c f , , " c n
beklemenin r u k m q n q l k m " d k t " o c n k { g v k p k p " f S u g e ŝ h q n f w
2009: 297).

D k t ± q m " ± c n , o c . " o c m g c n g g m " x k g n ' g f " g d Ñ " v m g k t v k c " d o
v Ñ m g v k e k " f c x t c p , , " c t c u , p f c m k " k n k m k { k " k
j c v v , p f c " d w n % 70 ç p " d Ñ m n g o g m g g k p f q n c { , " u , | n c
k ± k p " d g m n g o g m " { g t k p g g f m ç d w h ç g u o g Ñ v g g k t 0 4 6
2001: 277).

Talepteki belirsizlik, beklemede b k t d k t k p g " | , v " k m k " q n w o
± , m c t v o B u m h a r d a n f i l k i , t b e k l e m e n e f g p k { n g " o Ñ v g t k " m c { d ,
p k j c { g v k p f g " k n g v ö g " h i z m e t m k k p k g n k , p p " , c b e k l e m e d e u " , q n c
(Samson vd., 2020: 35). N k v g t c k v Ñ t k f t g k " p ç " | , v " q n c t c m " i g t ±
f w t w o w " c t c u , p f c " q r v k o c n " d k t " d g m n ö b e k l e m e u Ñ t g u
j c v v , k ö l e k i l m e k t e d i o * ¥ g x k m " a n , 2008[120). i B u s i s t e m l e r i n a n a l i z
g f k n o g u k p f g " c o c ± n c p c p n = g " { d e k m k i g o n g k " j q a n w v , c ' p u ' k v u p
v e v c n g r " ö k m v w n y w u w p f c " i l e b i l e c p k k b i z m e t c k a p a s i t e s i n i k t
belirleyebilmektir * U c t , c u 120) p . " 3 ; : 8 <

Bekleme j c v v , , f a s t g g l e c q t t k v u c k { c " ± , m c p " v c n g r n g t " k ± k p
u k u v g o n g t k p " f c x t & g ; d , g p m , n " g v g j ' a u k Ñ t " g c g o g c t e k , p i ' k k n g
o q f g n n g e t e k ' b u m o d e l e r ± v g k t ± n d e k g u n k g v o g a b l e t e k l e r i p e r f o r m a n s p
¾ n ± Ñ v n (E h s a n i f a u v d , 2017: 35).

Bg m n g o g " j c {v^{3/4}p, g"v vk ge qk t n k g u t k g " d k t ± B u m f a y d a l a r d a n f c " u
d c | , n w p t n , c t f , t " 52) C t u n c p . " 4 2 3 3 <

É U k u v g o f g " ± c n , o c " m w t c n n c t , p , p " d g n k t n g p

É Sistemde karakteristik parametrelerin belirlenmesi,

É \ c o c p " m c { , r n l a r n s e b e p l e r i m i g t e s p i t g e d e n e s i n o g

É F g k k m " u A t g ± n g t " u q p w e w " q t v c { c " ± , m c p " o
q n w v w t w n o c u , 0

1.1. D g m n g o g T e o j i s i n i n W c t k j u g n x ' g l ' g N i k k v g k t o c k v A t " V c t c

D g m n g o g g ' i t e k v k p ' g " , J o h a n s e n k * n m ' 2 6 D i n g , k n p o g o g " \ c o c p
x g " V g n g h q p n c (N u m b e r o f C a l l s a n d W a i t i n g T i m e s) o d c n , m s i d i r . " o c m c
Daha sonra bir t g n g h q p " k t m g v k p f g " o A j g p f k u n k m " { c r
(1909) v c t c h Q p d u , p n , m " V g q t k u k " x g T h e o r y o f P r o b a b i l i t i e s M q p w
and Telephone Conversation) o d c m a k a l e n { , c { , p n (B h a t 2 0 1 5 : v 4 - 5) t M o l i n a
(1927) p , v p F r y * 3 ; 4 e s e r l e r i , d e p u a l a n d c " i 3 / 4 t A n g p , o 3 / 4 p n g d e f a k t k u ' t ± 0 c
f 3 / 4 p g o f g m k , E r l a n g e n , p " o c g n e g h q p " k u y k u k b e k l e m e p r o b l e m i n i f g m k "
k p e g n g { g p " c t c v , t o c n c t , p d i p 3 ; d 5 k 2 " " x f g g " g t n g p t
c t c u , p f c n p k " ± f q 3 i l i n g a d a n g " d g m n g o g " j c v v , 3 / 4 p g q n k u k
m c v m , n c t f u r . R o l n w m o p o g v m " x g " M j k p v e j k p g " * 3 ; 5 2 + =
m c p c n n , " d g u r k u g o g o n g t k v - M j ± k p p v " e R o p g e h | q g t n o A n A p A
Crommelin (1938), telefon sistemlerinde bekleme ile ilgili olarak olas, n h q n t " o A n n g t
i g n k v P a l m o (1 9 4 7 + k t ' O f " g k g p " v t c h k m " { q w p n w m n c
u A t g n o g t o k p k v n " g t k p k " k p e g n g o k d g v m k t g O " g V g n e g h v q p " r
k p e g n g { g p " 3 ; 5 2 o n c t f c p e f 3 / 4 p ' e g m l g p t e o r i s y e n i d a n g n t n d k
d k n k o " c f c o n c t , . " d k t ± q m " m e t o c , m " u v q m e u v
i g n k v k t o g { k " c o c ± n - 7) o , v , t " * U c t , c u n c p . 3 ; : 8

I A p A o A | f g " d g m n g o g " j c v v u , " p x g p t u k u k s i n i m { 3 / 4 p g
i g p k " d k t " c n v u l n d A n e l g e u o k u p d q n n e n t g c o n g " " n j c c d v i l e v i l g i l i u k u v g
h c c n k { g v n g t k " c p c n k v k m g q k n , r e g l e c l e n i m " c A n m g o k l o f e g "
{ w t v f k o n u i l e p i l g i l i ± c n , o j c g n t c " t i f g c a r t g p " i u A p (G u n t h e r , 2 0 1 1 ; t "
18-19). Bw " m q p w f c " j n , k | v n g e t " c | v g A p t i A k p n n g g o p r o b l e m i n i n g e n e l d e
k n g v o g n g t k p k . t " g 3 / 4 h g n k p " k A p g A d i m " m g u n k o k p p g p u .

i ¾t Ñ n o g m d k p f g p n' c p Antonidesc vd., 2002:* 3; Ramachandran ve Chidambaram, 2012: 72).

U q p " { , n n c t f c " j k | o g v " u g m v ¾t Ñ p f g " d g m n g k p e g n g p f k k p f g = " d c p m c " w d g n g t k p k e p i s l e r i n c p , " u r e s t o r a n l a r , { g o g m j c p g n g t . " j c x c n r k g o m c " p n q c m t " , { h e k t e f i n e g " c q | n e w n j c v , n u c m t n . , m n c " ± c n , o c n c t { α " , Ñ n c g " p v k " o " q r k o w g w w t g 0 n " g u k u v g o n g t k p f g " k " c m , , p , " q n w v w t c p " k n g o o Ñ v g t k " d g m n g o g " u Ñ d v g " n g t c k n " ; k o { c k m . c g ' t f v c w p t " k n g o m k k . , ¾ | g v n g p g d k n k t <

" | f c q n 009), x k f t 0 " " c * t 4 c v , t o c " x g " w { i w n c o c " p r o b l e m i n e u k o Ñ n m o d e l i n i q w p { " i w n c { c d w m t u r u D w " Ñ t o c n j , c w e ç k a g , " a c i l s e r v i s l e r i n f g " d g m n g o g " r t q d n g o n g c k p g d i l c s e r v i s p Ñ " o ç Ñ t d c x w t o c f k g n f n g p g d o k t o n v e j p g d c k m t g " i ¾ t e k g n x i " k r n n k c " p k n c n t g , v c x u k { g n g t f g " d w n w p w n o w v w t 0 "

" | m c p " b k 4 t 2 " 3 d e . t " , " o g o v (m g , | n i p d i k l e t t e k l a m e l ' y a p v , , ± c n , o c " u q p w e w p u Ñ t g n a z g l t o k v p n k o d e m n W i n Q S B p a k e t r t q i t o Ñ , v g n k s i " u v g { a u n k n t e , k ' f g k v k t k n g t g m " { c r , c | c o n , w e , d n g m n g o g n g t " k { k n g v k t k n o k v k t 0

Weng vd. (2011), sk o Ñ n c v e V Z A p (V e r i Z a r f l a m a A n a l i z i) m o d e l l e r i i l e V c { x c p ø f c m k " d k t " j c u v c p g p k p " c e k n " u g t v x , k t u 0 k " k ¥ c n , o c p p o t a n s i y e l d a r d e q , = c " | n c t k . " d g n n k t n n e g k o v e b i k l e m e n c p f , u Ñ t g n a z g l t m k p . k D w " p g f n e l p k e g n g ¾ e w v " f w t w o y o n k m o d e l i p " u k o q n w o v w t v w n t 0 " F g j e w u q p w t w o w " k { k n g v k t o g { g " { d c a l t e r n a t i f 3 2 a d e t k { k n g v k t o g " u g p c t { q V Z A " m o d e l i k ± v k w p t " w n b i r e r k a r a r v e r m e b i r i m i o l a n s e n a r y o l a r d a f q m v q t . " j g o c k t g ç x g k ; " { d v ç d o k t o r v e j g o k t g " m w l e r i n i l e c p t , v o c " n { c Ñ o | c f " g u k u v g o f g " d g m n g o d g n k t n g p o k v k t 0 "

Al-Refaie vd. (2013), bir hastane acil servisinin r g t h q t o c p u , p , " u k o V Z A m o d e l l e r i i l e a r t v , t o ± c { n , v , 0 g x e w v " f w t k w o o Ñ n k c ± k f m p " o c q n w d u k t a t s o n r a j g o k t g " m w n n c p , o , p c " d c n , V Z A n v g t p m o d e l i k ± k p l e r , i j l g t o f k t g " u c { , u , " x g " q t v i k e n e p l a r v e u k u v g j k | o g v " x g t k n g p " j c u v c " u c { d i n , " x g " j g o k t g n g t

Jalali vd. (2014), d k t " v g n g h q p " v c o k i n t k " x " g c " m Ã t g , v p k , o " " q k r
 k n g , o Ã n t g g t v k k o " u Ã t g n g t k " d c m , o , p f c p " c p c n k | " k { k n g
 v k t o k Ã t v g t k o " " ¥ u Ã t , g ð n g f i t g k n ' h g n g m o d e l l e m i n i n k n k " h
 performans analizi yap, arak mÃ v g t k " o g o t v w p k e g m k p k g " " d t g m c d g
 u c n c { Ã d l g n g o g Ã n t Ã g f i g k e | d g " { x k g " " j c m m , p f u l o " w f u r p g t k n g t f

Karanfil Kostak (2016), u { i w n c o c p , p " { c r , n f , , " ± c t
 v g o u k n e k m a k i s t e y e n d Ã n g p k " c u | c c { n , v n o c c t { ± , n p c , v o , t k i n D w p w p
 ± c t , " o g t , m r g k p k n p g f o g n " g { t k ' r e n t ' a u u , t p s f i n c k ä r t f b l o k e m c m f c , p t o c
 k n g o Ã p k g t o k Ã n g t g k p k " v g o u k m g e p k f u k k " p m g ' p i f k k v n o g g t f , k g p p g " " u c
 n c . D ¾ { m i g g e n g g p " ± c t , " u c { c , | u c , n " o x , g " v d , g t m n g o g " u Ã

I Ã p g " x f 0 " * 4 2 4 2 + . " u k p { c h k m g r , g p h k t q t o n c p u c
 d g m n g o g g ' q t e k v u k " k n g u " v k p p e d g w m g " o b k i A u p a i k ¾ k t 0 g " p m c f x g " c m v c p
 g f k n g p " k m k " j c h v c n , m " i g t ± g m " p g k k g k p p " f u g , m w ' n c n t e
 a m , , p , p " h q c n t f n o , w p Ã f k n k o k " k p e g n g p o k v k t 0 " O c
 { ¾ p v g o n g i l e c n t , o e { q , w p n w m n c t , . " m w { t w m v c " m e {
 w | w p n w w . " u k u v g o f g " i g ± k t k n g p " | c o c p " i k d k
 r g t h q t o c p u " ¾ n ± Ã [v c n r g , t r k c " p g " n d v g " Ã g c n , h o g c n " v k k i f g o c c v
 sinyalize sistemlerin optimal ± c n , o c f , , " x g " m a z a l t m a d a v y a t e r l i w | w p n
 q n o c f , , = " m f q n c f n , " u m , q { n m c c t , p c " v c p , p c p m a { g k n
 u , t c n c t , i l o g r ' g k k k j n g { t e s p i t ' g f k w n 6 B w " w u k c t { 0 g f g " | c o c p
 g p g t l k " i k d k " v c u c t t w h n c t , p " g n f g " g f k n g d k n g e

Grozev vd. (2020), D w n i c t R o u s s e c m p g o p , v p k " p f g m k " ¾ | g n " d k t
 c v ¾ n { g u k p f k g ± " k c p t " t a l e n g e r i n g e p d e k i l m e q t c p , p , p f a z l a q (% 5 2) w m ± c
 o l f w w p w " v g u A r c k ± v n " c g t v , o p k " i v g k n t k 0 " u , m n , , . " d k t " c t
 ortalama u Ã t g " i k d k " i k t f k n g t k p " c p c n k | " g f k n o g u k
 c v ¾ n i n d g m n g o n d a k j { a m u g c n c p o , v , t 0 "

¥ c n , m c p " * 4 2 4 2 + . " j c | , t " i k { k o " d a u k g m i v ¾ t Ã Ã
 m e r c u k v g " m w n n c p , 6 Ã u d e v c v p n c c t t c , n p " , m ' c o r e c m u k k v o g w p o k " p " g
 f c t " d q c | n c t , " q t v c f c U p k " o Ã c n r c f u , { t q o c ' { c n q " f c g m i d k { ± c n n c w o r
 w { i w n c o c " u q p w e w p f c . " g k m k i t a n f e g Ã " k m o n g p v o m n i ' c m t - , t ' h g v n
 o g x e w v " f w t 4 w 5 0 " c q " t i b i p t , g p v f , c " " i ¾ | n g p o k v k t

V q u w p " * 4 2 4 2 + . " j c | , t v " g i u k k u k p ' f g c t x g p k d u k p n k k
 maliyetin f Ã Ã Ã to g u " k i p g k t g m n k " q n c p " k i Ã e Ã " o c m k p g " m c
 m w n n c p c t c m " o Ã v g t k " v c m g t n g t n k p p l o ' c g m u p k m u k | ' h x
 Ã t g v k v o , " p j p v m w t w n o c u U k o Ã n e v u c ' { t o p c i o w n c v p f t , 0 ' c p
 sonucunda bir Ã t Ã p Ã t g v k 3 k 5 f " g f c m k m c " r k c { p k o n , g v , t 0 " O g x
 % 9 9 " q n c p " m c { p c , 9 4 m , w k k n k p d o " i q A p c n p Ã n Ã " r g q n g w k g p
 o k m , 2 3 a d e t e n 3 4 a d e t e ; i Ã p n Ã m " q t v c n c o c " r c i n e g 4 2 1 a d e t e n o k " A
 844 adete ± , m c t , n o , v , t 0

Zandi vd. (2021); d g m n g o g " j c v v , " v g q t k u k ¾ p ' u g i l o n Ã g n t e u
 Hamedan elektronik k t m g v k " q n c t c m " j h k | c o n g v ' g k ' f i r ¾ u e p u l g p
 analiz etmeyi x g " { g p k " d k t " o q f g n , ¾ c o n g , t o o g c { p k , " p c ' o u c q ± p n w e
 r g t u q p g n k p " { g p k " v c u c t n c p c p " s o n u c k u n d a k b e k l e m e t q i t
 u Ã t g d g g ¾ p g b o d k t " c | c n o c " m c { f g f k n f k k " d g n k t v k

C mi Ã p " x g " (2021), u ± c t n u , m c " p j " k | o g v n g t k p g " w n c
 m w { t w m n c t , p " c | U o n v n , n m ' c D c 4 n 2 c 3 o 2 c " e { , { m p p f c " u c n
 r t q i t c o , " k n g " d k t n k m v e g v " v r , k n q ' v O " g d ¾ n g i l g k n ' g J t g " m u k g ±
 w { i w n c o c u , y p k " B u s i s t e m i f k g | p " " g h c { f c n c p c o c { c p " x c v e p
 g f k n g d k n o g u k " k ± k p " n q m c n " q n c t c m " d , k h e k i m o w c {
 r g t h q t o c p u n c t , " g v m k k n { g k p m o g g f v g k p t " k d n g o m k n g v o k g t " O u Ã t g n

C u n c p " x g " " | f g t k t " * 4 2 b e k l e m e l e r i n ¾ ¾ | g n p g " o u n c g c p v f r k g
 Ã p k x g t u k v g " ¾ t g p o e q k f " g h g c j g n w j c v p w g u k w " k w n e v u t C t g p
 durum inceleno k bekleme u Ã t g fi Ã t Ã p n e v g g m p c v k h " u g p c n t e l e r q n c t
 { c r , n q q w p t ' O d e k s i s t e m d e 4 0 d a k i k a d w n w p c p " ¾ 3 0 g p f e c k m k g n t c
 d g m n g o g m n g " i g ± o g m v g , f p k " t f 0 g " p l e n p v e g t i p k t ' v v k o h w ' p u " g k p { c k t n
 u k u v g o f g " i g ± k t k n g p d ' g u m Ã t g o p g k ' p u " Ã 4 g " u k p k m k ' m d k u g .
 k p f k t k n i g ¾ d u k v n g g e k g n o k k " v k t 0

[, n f , | " x g " M c p d w t q n w " v u r u d a 2 b a l u h a n . j " c u e k n e t u
 memnuniyet f Ã | g { ¾ g n ± k Ã m i k e ¾ p k g j n k u m n e g c n t n g p g " u Ã t g n g t k
 j c u v c " o g o p w p k { g v k p g b e l i r l e n m e s i k i " c g f e p c R i z e t E d i t i n e
 A r a t , o t c " J c u v c p g u k " ¾ q e y h n { C e k n e p o c k u v g c u n k c c t o , c p f " c o v
 radyolojik tetkikler, kan alma x g " t g ± g v g " { c e r i v e t a b u r c u i o l m a l | k c " o v c g p f n e c x t k
 kay , v " c n v , p H a s t a l a r a , o p o p w p k { 0 v " f Ã | k g k i l o g m e m n u n i y e t ¾ n ± o

3/4 n k g' w { i w n Hcpuov, c nvc, tt, Op" m n k p k m v g m k "gereke f v w tn v 'b k ±
gerekse f g " { w t v " f , , p f c " { f c r j, m c fp Ñ du k t n p ± w c m f p c c 'w x, c t o,

Loso vd. (2021). " C o g t k m c " u c n , m " u k u v p e d i a k r i p a c i l g " m c f
servislerin d g m n g o g " u Ñ t p g, u p p g l o p 'k c' t d k o c' u , t p f l a g 'b j' c t n g m g
H n q t k f c ø f 3/4 ù h g t a s t m e n i g k e t k n " u g t x k u " d g f n h m e y i g v' k u t Ñ
c o c ± n c V c, t q v , c' t p S a d i k . , " i Ñ p n Ñ m " x g " j c h v c n , m " q n c t c
edilerek d g m n g o g " j c v v , p , " o q f g k n n o g k (P g v p k i t q d p k g t n " g ü k g u n v"
3/4 f g o g s a t l e r p l c | , p v e t a l e b i c g t | n e r e k j v g f t g h " g u' Ñ t n g m g t n n c p o ; v

Stahlbuhk vd. (2021). " h a l g o r i t m a l a r " k u l l a n a r a k d k t " j k | o g v " u g m v 3/4
w | w p n w w p w " g p " c | c v , B i r p a k e t l e m e s e r v i s k n d e p a k e t l e r i n n r a s t e g e
v g m " d k t w " n v c g | v i , ¬ j, c' " u k u v g o f g b i l g e c k " a l t e r n a t i f b e l i r l e n e r e k m g v n
d g m n g o g " j c v v . , v " k k { k n g v k t k n

Bg m n g o g " j c v v , " v g q t k u k p k p a h d t p m e c e k n g m g m g
k p e g n g p g f v k m k p r f k g m " H a c t a g o m n g g o k m o d e l e t i w g , " h c t m n , " j
o g m c p k | m o w n m c t p , c " m c i n 3/4 m Ñ n o Ñ v Ñ t 0 " D | w ö g v c " u m c { p a m c'
f g k v k t k n g t g m " ± g , . k " v j n k k | " o u g g v p " v m c p p c n o c , t p ' g v p { " d i g w n i c v
f w t w o n c t e n , w p { c i " w i p 3/4 t j g k | o g v " f Ñ i c g f e k e m k p U b g d l a m a l a r d a 0 g p o
g p " W i n e s s " S i m u l a t i o n S o f t w a r e , A r e n a , S i m a n , A n y L o g i c S o f t w a r e i k d k " u k o Ñ n c
r t q i t c o n c t , " k n g " { 3/4 p g { n g o " c t c v W i n Q S B p a k e t " w { i
p r o g r a m , f p c p " h c { f c D w e " p ± , c n n o , , o v c , n t c' t f w c' p " g d n k | n , f r g c' t 3/4 , | g v r

¥ g n (1994), b k t " d c p m c " w d g u k p g ' F I F O k u y r u l m d s i p l i f i i d e Ñ v g
a n a l i z e v o k v k t 0 " c v c' n , c { a c n f , c' . r " t v q f i d t c f o , n o p t i o n a l B e l e n e r e f g n k "
u Ñ t b g l w p k o w u k x g ' g o " g t , v t m , k i p m , k v k , " t e t v

C m c t ± c { d k 4 2 d c p m c d " g m w g g u g k' p j k v u v k , u " v r g t o q " d { n c g n o n k
c ± , u , p f y e r e k d u k u p a n a l i z i y a p m , v o n s t u z 0 " g t k " , s o n s u z k u y r u k l u y e
± q m " m c p c n n , " d k t " o q f g n " q n c p " d h c q t m n n' , " w u l c g f u , k f p d k
± c n l a r a k Y k , p S U D " r c m g l e v a h a l i z t e f q k i n t e c k o g , p " k " d k t i l o u k k u v v k g t o 0 " 3/4

[, n o c | " 3/4 g 2 d k t " 3/4 c p m c n l k u l l a n a r a k u l c p k m p e l e m e t' k n g
j c s i s t e m i n i k p e g t i r . W i n Q S B r c m g v " r t q i t c o , " k n g " H o K , H Q . " m w
j k | o g v " x g t g p " r g t e r e k q i g n v ' g o c' g t , v t m , k i p m k v k , " t e t v k n

G t f q c p b k * 4 ' 2 l 3 2 p + m . c "" ± c t , " o g i l k m g i | k k n p k g " " x w g n t c k n e g
± c a r a k ± c t , " o g t m g | k " x g t k o n k n k k p k p " g p " ¾ p g
r n c p n c p c p " j g f g h " m c { t , " , c n o c c o ± c Y " l c o t S U P D , " p t o " h g , v m a t t a q
3 : 3 " , h i c ã t p m n , " o ã v g t k " v g o u k n e k u k m a t c { , , m a t c , "" d k t r
kapasite kullan, o " q t c p , " c t v v , t , n o , v , t 0

Mehta vd. (2011), b k t " d c p m c p , p " h c t m n , " w d g n g t k p
k { k n g v k t k n g t g m " d k t g { u g n " n l , s a p a k a t i n e x , g n " , g n v " m o k ã p n v k
c t v v , t " o o c ± d w p o w p g v k n t k o p e t g m " n c , c o c n , " d k t " d g m n g
o ã v g n e g l e r e c { t , h i z m e t a d o m e n c c t o , c p ± , n c { c p " d k t " u k u v g

Hao ve Yifei (2011), b k t " d c p m c f c m k " d g m n g o g " j c v v ,
problemleri gidermem " k h c k t p n n , u ' c j k n | c o { g , v e ' n g n ' c u k o ã n c ' u x { g d ' p q " r { v d
j k | o g v n l b e l i ã d o g { k v k t 0

R c u e j q w " x f 0 " * 4 2 3 4 + . d ' g j n k l g o p r o b l e m l e r i n i n a n a l i z i g n g t
x g " ± ¾ | ã o ã p g " k n k m k p " m , u c " o g u c l " u g t x k u k "
artv , t o o c ± n c y o c , n , v , d o f " d . c ' p d n c " w d g u k p f g m k " o ã v g
u ã t g n g t k . " g n g m v t q p k m " d k n g v " w { i w n c o c u , " k n g

Ngamsirijit (2012), b g m n g o g " j c v u y g u l a y a r a k b i r b a n k a d a k k h i z m e t
f ã | g { k " k n g " k n i k n k " g u p g m " d k m w f t c w n l ' k d g ' m n i g g d h g t
g p " w { i w p " r g t u q p g n " u c { , u , " k n g " k { k n g v k t o k

Taufemback ve Silva (2012), d c p m c e , n , m " u g m v ¾ n t e ã u y f u n g " t g |
f ã | g { f g " , m w k c + m k o p k " h o g t k p f g " o g x f w t v " d k o p m e c ' n , w d
b k n c m u i n c a l e w k v i k i t k o n i k d " g m v n d g g o g " j n i c q v n v a r a k o c ã f g r g k k " m w
bekleme u ã t g h g k k g k v k t o k v k t 0

Augustine (2013), P k l g t { c o f c " W p k v g f " D c p m " h q t " C h t
d c p m c " w d g u k p f u g " u d g m k g k g v b l i n e g o , g v " k u ã t g n g t k p
v c t c h , p f c p " m e ã w g ' i n d i r i k a n l i y e t k u n s g r u n g f n k " m m c v g " c n c t c
r g t u q p g n " u c { , n o i t a n a l i z k v m o g k . " u w k u t v g o " g v m k p n k k

Paradi ve Zhu (2013); b k t " j k | o g v " u g m k ¾ t ' ã p f t g b e k l e m e c p o n k
j c v v , " m o d e l l e r k \ n c g " d k t n k k + k v g ' c ¾ n ± o ã m m g { g " c k v , " { c r
k p e g n e g a n k a l a r i l e k n i k n k " g v m k p n k m " ¾ p g t k n g t k " u w p o

Ramachandran vd. (2013), o \tilde{A} v g t k " o g o t p , w p d d m v k p g h 'c f i k d bankap , (ICICI Bank Ltd.) 6 8 " w d g u k p f g p " u g \pm k n g p " 4 2 " h c t r u \tilde{A} t g i , n j g k t | k o g v " m c n k v g u k " $\frac{3}{4}$ n e - a n a l i z ' e v c o t k e b c , p " m c p i s t e m p " " U g t { c r , u , " k n g " k n i k n k l o " c d u g , m p n c g " o { g $\frac{3}{4}$ p u g \tilde{A} n t k g m " g $\frac{3}{4}$ p k g p t k p n " g c t | f o

Madadi vd. (2013), b k t " d c p m c p , p " h c d t g m m , g " o g w d n g p g v t k k p Y k v p g u u " U q h v y e t g { u k d i l e m o d e l l e t n k p B d r p t t d i " t \pm c o n , , " c p , o c u c f c " i $\frac{3}{4}$ t g x " { c r c p " e r e k g v e $\frac{3}{4}$ k e k H i z m e t k u l y r u k d i s t i p l i n i f g k m w n n c p y c m , c i t c \tilde{A} p n " c u k q p n c t " u q p w e w p f c " r g t u q p g n k f w t w o n c t , p c " i $\frac{3}{4}$ t g " g p " w { i w p " j k | o g v " f \tilde{A} | g { k " c

Chowdhury (2013), i u n c o k " d k t " d c p m e g m " e d i n d e t c m c , p " c o g m e p k | o c u l , g m a n " g o g d e l i n i k u l l a n a r a k o \tilde{A} v g t k n g t k p " m w { u \tilde{A} t g n g t k p k " g p " c | y i " c o c c n e k { H K H Q h g W k t l w m g f k k k o g a n a l i z e d i l e n d g m n g o p p r o b l e m i m a l i y e t m t k v g t k " $\frac{3}{4}$ p \pm e $\frac{3}{4}$ g n \tilde{A} k n m " \tilde{A} c n v , \tilde{A} p t c o t

Iwu vd. (2013), d g m n g o g " j d $\frac{3}{4}$ p , v " g c k u l l a n a r a k p k " d c p m c p , (Intercontinental Bank, Gateway Bank, Equity Bank ve Global Bank) bireysel ve r g t c m g p f g " d c p m c e , n , m . " g n g m v t q p k m " d c p i m c e , n v e r i m l i l i k a n a l i z i n i . " o \tilde{A} v g t k " i g n k " u \tilde{A} t g n g t k p g n i i $\frac{3}{4}$ t g a r t v o t . v , t

Ullah vd. (2014), n i t e l v e n i c e l { $\frac{3}{4}$ p v k u l l a n a r a k \forall k p o f g " h c c n k { g v " i d c p m c u , p , p " o \tilde{A} g v g n k p n g m k $\frac{3}{4}$ g . M \tilde{A} n c i l ' g i m l e g " o g o d e j i , c t v v , k u l l a n , a n a k { c r , n c p " c p c n d k g | m n g g t o " g u " q u p \tilde{A} v l e g w p g f t o k g p " f u v g , " t 10 c

Berhan (2015), A d d i s A b a b a d a h c c n k { g v " i $\frac{3}{4}$ p v g p t " g d p g " m d l g t o " g c i s t e m i n i , b i r c { " u \tilde{A} t g " k n g " v q r n c p c p " { x c g t f i l e a n a l i z e t n k f o k t p G p " w { i w p " j k | o g d g o l u t p e a m i ' , v " g u a k , v u ' , g n f c k p n f c k m " k n i w n c n n q t c p , p , p " i g t t v m , v t k , i k o ' a u v , p , w e 0 w p c " w n c , n o ,

Eze ve Odunukwe (2015), b e p m c e , n , m " u k u v g o k p f g h " c t \tilde{A} n n v , g d g m n g o n g o d e j i n i u y g u l a { " c t c m " g v m k p n k m " k $\frac{3}{4}$ m g \tilde{A} o ' \tilde{A} n " c { p c m a n , c t m e n o c " x g " o g i w n " q n o c " m q o p n v , u w o ' c g f u c c " u o ' \tilde{A} c n v , g p t c k t c | c n v , n o , . " u k u v g o " k { k n g v k t k n o k v k t 0

O c t w h " x g (2018), b i g b g k n t g o g " h j u l u n a n h i z m e t f a n a l n c t , p , p " j b i r i n i n v q r n c o " d g m n g o g " u \tilde{A} t g u A K S p * k C " p p c g n " k m d k f m c " t J " k g v g m k

{ ¾ p vile bekl'eo k . V k n , o c f c " u w p w n c p " { g p k " { clann c ,
mevcut d g m n g o v g' q t c k w k " { c m n c , o , " k n g " g n f e g b'ir g f k n
j k | o g v " m c p c n , p , p etkidi g m' n t g o' g c' { u t Ñ t " g d g g n k t p r g g' p g t g
h c t m n o r t a f c h m q p w n o w v w t 0

Abusair vd. (2021), kuyrukta d g m n g { g p " o Ñ v g t k n g e k i k p " d
belirsizn k d k . t " t c p f g x w " u o k g u { v k g " o k ð c k ± n a g d e u , { s i t p m i n i 0 " T
w { i w n c p o c u , " p g v k e g l a z a l m a f v g u' k d u g v m g n o g f o g g " " k u { Ñ k r g g n g d g k }

D k t k ± k " * 4 2 4 w d i n o Ñ p g k t t k " d c p o m p e w p k { g v k e t e r l i c n c
g n g o c p c " u c j k r " q n w r " q n o c f , , p , p " { c p , " u , t c
c n , p o c u , " { c " f c " k v g o l a r a k e t k i s i m k ' t c t n o c k u g t p e g p m' n g g m t q p k
u k o Ñ n m o d e l i q s o n u c u n d a , b a n k a w d g u o k g p x k e p w v " m c { p c m n c t n c "
{ ¾ p g v k n g d k n g e g k " x g " v c u c t t w h a r a k { k a l i t e l i h i z m e t k ± k p
s u p w n c d k ñ ¾ g v g t k n o k v k t 0

D g m n g o g " j c v v , " v g q t k u k p k p " d c p n v c e d , n m , " m " ø u f
¾ | g v n g p o k v k t

Tablo 1. D c p m c e , n , m " U g m v $\frac{3}{4}$ t Ñ p f g ili D g m n g o g " ¥ c n y , ö V g q t k u k " k n g " n i

¥ c n , o	C o c ±	Kuyruk Disiplini	Program/Model	F c , n , o	U q p w ±
¥ g n k m " * 3 ;	D k t " d c p m c " w d g u k verilerini analiz ederek optimal bekleme u Ñ t g u k p g " w n c o c m "	FIFO	V c o " u c { , n , " modeli	-	U k u v g o " g v m k p n k k
C m c t ± c { " *	D k t " d c p m c " d g m d g o g r t q d n g o k p k " u k u v g o inceleyerek durum analizi yapmak	FIFO	Y k p S U D " r c m g	I g n l i n P o j s s o n , h i z m e t u Ñ t g n g u k g k ß " f w { f w w " x c t u c {	H e t m n , " u c { , f c " r g w { i w p " j k o g v u " c { d g n k t n g p o k v k t 0
[, n o c " * 4	" g n " d k t " d c p m c " kullanarak d g m n g o g " s i s t e m i n i incelemek	FIFO	Y k p S U D " r c m g	I g n l i n P o j s s o n , h i z m e t u Ñ t g n g u k g k ß " f w { f w w " x c t u c {	J k o g v " x g t g p " r f g k v k t k n g t g m " k p e g n g p o k . " g p " v u c { , u , " d g n k t n g p o
G t f q c p " *	D k t " d c p m c p , p " ± c t , q t c p , p , . " r n c p n c p c p ± , m c t o c m	FIFO	Y k p S U D " r c m g	I g n l i n P o j s s o n , h i z m e t u Ñ t g n g u k g k ß " f w { f w w " x c t u c {	3 : 3 " i Ñ p " h e t m n , " u c { , n c t , " k n g " { c r m c t , n c o c " q t c p , " q t c p , " c t v v , t , n o ,
Mehta vd. (2011)	D k t " d c p m c p , p " h e t m n j c v v , " u Ñ t g n g t k p k " d c p m c e , n , m " o Ñ v g t k u c f c m c v k p k " x g " g v m k	FIFO, PRI	R q t v g t " f g modeli	-	O Ñ v g t k n g t k p " u g i yoluyla hizmet c n o c n c t , p , d k t " u k u v g o " $\frac{3}{4}$ p g t k
Hao ve Yifei (2011)	D k t " d c p m c f c m k " d g m v , m c p , m n , m n c t , " x g "	FIFO	Enterprise dynamics 4DScript modeli (Olay of c m n , " d k t " r t q i) t c o ,	-	D g m n g o g " j c v v , p f d g n k t n g p g t g m " h u c n c { , e , n c t , p " u x g " q r v k o c n " j k d g n k t n g p o k v k t 0
Paschou vd. (2012)	J k o g v " k n g v o g n g t l r t q d n g o n g t k p k p " c p c m , u c " o g u c l " u g t x i u e k o Ñ v g t k " o g o p w p k { g v	FIFO	F q t w u c n " r t modeli	I g n l i n P o j s s o n , h i z m e t u Ñ t g n g u k g k ß " f w { f w w " x c t u c {	D k t " d c p m c " w d g u d g m n g o g " x g " j k o g d k n g v " w { i w n c o c u , i n f k t k n o k v k t 0

Yazar, Yılı	Çalışma Başlığı	Kuyruk Disiplini	Program/Model	Yöntem, Araçlar	Uygulanmış Alanlar
Ngamsirijit (2012)	Dg m n g o g " j c v v , " o q f d c p m c f c m k " j k o g v " f { c r , f c " d k t " r g t h q t o	FIFO	Y k p S U D " r c m g	I g n l n R o s s t o n , h i z m e t u Ā t g n g t u k g k p " f w { f w w " x c t u c {	D k t " d c p m c p , p " m w { g p " w { i w p " r g t u q k { k n g v k t k n o k v k
Taufemback ve Silva (2012)	C m v k h n g t k p f g " o g x f w d c p m c " t w g l g g u t k x p " l e i p u y g u m f Ā g { f g " m w m m g p g c " n j " c q n w v w t o c m	-	Erlang B ve Erlang C d g m n g o m o d e l j i c	I g n l n R o s s t o n , h i z m e t u Ā t g n g t u k g k p " f w { f w w " x c t u c {	K u { t w m " d g m n g o g k { k n g v k t k n o k v k
Augustine (2013)	P k l g t h c o f i k { g v " i b a k u v w d g u k p f g " d g m n g o g k { k n g v k t o g m	FIFO	S P S S r c m g v " r t	I g n l n R o s s t o n , h i z m e t u Ā t g n g t u k g k p " f w { f w w " x c t u c {	O c n k { g v " w p u w t w " h e t m n , " r g t u q p g n " u k o Ā n c u { q p n e t " u Ā t g n g t k " c c n v , n
Paradi ve Zhu (2013)	D k t " j k o g v " u g m k v e t r g t h q t o c p u , . " d g m n m o d e l l e r i k n g " d k t n k m v g " ¾	-	VZA modeli	-	4 6 " c { t , " Ā n m g { g " c ± c n , o c " b a n k a l a r i l e g i l i l i b g v m k p n k m " ¾ p g t k n g
Ramachandran vd. (2013)	" g n d " c d p k n t c " f c m k " o Ā v g a r t t , t o c m	-	S E R V Q U A L m o d e l i	-	D e p m c p , p " 6 8 " w d g h e t m n , " j k o g v " m u Ā t g n g t k = " C p q x c " g f k n o k . " u k u v g o d g m n g o g " u Ā t g n g t { ¾ p g n k m " ¾ p g t k n g t
Madadi vd. (2013)	D k t " d c p m c p , p " h b e k l e m e n j c g v m k p n k k p k " u k o Ā	PRI	Witness software sk o Ā n c u { q p "	I g n l n R o s s t o n , h i z m e t u Ā t g n g t u k g k p " f w { f w w " x c t u c {	D k t " d c p m c " w d g u k c t m c " o c u c f c " i ¾ t u c { , n e t , " f g k u k o Ā n c u { q p n e t " u q - v , n " m e n o c " x g " f w t w o n e t , o p t i m Ā l h i z m e t g f Ā g { k " d g n k t n g p o

Y c n , o	C o c ±	Kuyruk Disiplini	Program/Model	F c , n , o	U q p w ±
Chowdhury (2013)	u n c o k " d k t " d c p m c p , d g m n g o g " u Ā t g n g t k p l k { k n g v k t o g m	FIFO	F q t w o g r a m l a m a modeli	I g n l i n P o i s s o n , h i z m e t u Ā t g n g t u k g k ß " f w { f w w " x c t u c {	D g m n g o g " j c v v , " r m t k v g t k " ¾ p e g n k m "
Iwu vd. (2013)	Intercontinental Bank, Gateway Bank, G s w k v { " D c p m " x g " I n q x g " r g t c m g p f e l e k t r o n i k d c p m c e , n , m " d k t k o n g personelinin verimlilik analizini yapmak	PRI	Matematiksel programlama modeli	I g n l i n P o i s s o n , h i z m e t u Ā t g n g t u k g k ß " f w { f w w " x c t u c {	O Ā v g t k " i g n k " u Ā u k u v g o f g " d g m l e r i g k { k n g v k t k n o k v k
Ullah vd. (2014)	D k t " d c p m c f c m k " o Ā v p k e g n " { ¾ p q g o k g t e n " belirlemek	FIFO	POM-QM software f q t w u c n " r t modeli	I g n l i n P o i s s o n , h i z m e t u Ā t g n g t u k g k ß " f w { f w c w " u c { , n o ,	Y k p ø f g " h c c n k { g v d c p m c u , p , p " o Ā v { c r , n c p " c p c n k n g u Ā t g n g t k " k { k n g v
Berhan (2015)	D k t " d c p m c p g p g " j c v u k o Ā n c u { q p " k n g " c p c	FIFO	Matematiksel programlama modeli	I g n l i n P o i s s o n , h i z m e t u Ā t g n g t u k g k ß " f w { f w w " x c t u c {	G p " w { i w p " j k o g v d g n k t m g ß p k m " m w n n c t v v , t , n o c u , " { q i g t g m v k k " u q p w e w
Eze ve Odunukwe (2015)	D c p m c e , n , m " u k u v g o k k n k m k ø g ' n h c g t o n g d e l l e r i n i v analizini yapmak	FIFO	Markov karar s Ā t g e	I g n l i n P o i s s o n , h i z m e t u Ā t g n g t u k g k ß " f w { f w w " x c t u c {	J k o g v " m c p c n n c t , o g i w n " q n o g c u " c m ÷ p e { c r , n c p " ± c n , o c f c c n v , n o , v , t 0
O c t w h " x g " (2018)	D g m n g o g " j c v v , p f c " j v q r n c o " d g m n g o g " u g v m k n g f k k p k " d g n k t sunmak	FIFO	AHS	-	J g t " d k t " j k o g v " j , , p f c m k " h c t m n , konulo w " x g k { k n g ± c n , o c n c t , p f c " m c p c n n c t , p c " ¾ p i g t g m v k k p g " { ¾ p u w p w n o w v w t 0

Y c n , o	C o c ±	Kuyruk Disiplini	Program/Model	F c , n , o	U q p w ±
Abusair vd. (2021)	D g m n g o g " u Ñ t g n g t k p k ilet c p f g x w " u k u v g o k " i	PRI	N k v Law georisine dayanand g m n g o g c n i q t k v o c u	-	Randevu sistemi uygulanarak bekleme u Ñ t g n g t n k o , v , t
D k t k ± k " *	Bir banka w d g u k p k p " o g o p w p k { g v k p k " kuyetirip g n g o c p c " u c j k r " q n w r	FIFO	U k o k q " u k o Ñ r t q i t c o ,	I g n k n g t k p " R u Ñ t g n g t k p " Ñ f i c g p , u w { f w l g w " k t n g p o k	Banka w d g u k p k p kaynaklarla k { k " d k t " g m k n f g v c u c t t w h " { c r o c m " ± , macak , n kaliteli hizmet sunw n c d kin ³ uevgg tkk n o k

I g n k { p' c m c }; p , " v Ã t f g p " d k t k o n g t' k l k t q n w m w t' k
o Ã v g t k n g t k p " i l g g m f k k " k m " c c { p p c c " m Ã v { n c g p k k' t o Ã u w g g k h
ya da sonsuz olabilir.

I g n Q t c " p); Belli bir zaman diliminde j k | o g v " c n s i s t e m e n g e l e n | g t g "
ortalama o Ã v g t k " u c { , u , f , t 0 " I g n p " R 3 4 k n g u n q p , n f g t k
s c d k v " k g u' v Ã g n " o f n w n n a p o ñ o c m v c f , t 0

Hizmet Q t c p); Belli bir zaman diliminde j k | o g v " x g t k n g p " q t v
u c { , O Ã f r i e t i n 0 h i z m e t u Ã t g n g i s k h i z m e t q t c p y p m p (Ã n i f o g m)
f c , n , o c " w { f w w " u 3 4 { h i z m e t g d k e p k n t e 0 " , M d k t u o g c' G t m " c
q n c u , n , m " f c , n , o n c t , " k n g " k h c f g " g f k n k t 0 " "

1.3. D g m n g o g " J c v f g p g k u t f g o k p k p

D g m n g o g " j c v o , c , e Ã k w g g k n g k k p " u u Ã t u l e h i z m e f g " d g
birimlerinin - v q , n n o c " { c p k u " Ã d t q g u " k m ' c p n f o c c " " q r v k o m n C f f 0 , p e i o g { g
d g m n g o g " j m w v t w m k w v g v o d k w p " w g' x m i d ' p u p k l u p v k v l i e k n g t g
verir (Kazan vd., 2012: 264).

Bir d g m n g o g " j c v j v k , | " o u g k v u " v e g n o o k c p n f ' j g k | g g g " o Ã c p g p
kaynaktan gelir. Hizmet u c n c { , e , n c t f c p " d k t " { c " f c " d k t m c
d k t k p f g p " j k h i z m e t u c' c m c , t , " e { , c n " c f t e " " o g i w n " k u c g " " x c t
m c v , h i z m e t " u x g " c u , " m g p f k p g " i g n g p g h i z m a t c u f c c t n , c n w t e t ,
j k | o g v k p k " v c o c o n c f , , p f c " u , t c f c " d g m n g { g p
d w " o Ã v g t k { k " j ; k p a g p g " c n c t 0 " O Ã m k p g k " " u l k r a n t e k
bir e c p n , " { c " f c o l a b e l i c h i z m e t i n v a o t a n a p o c u , k p y u l p a " c t f ,
j k | o g v " c n o c m " Ã | g t g " d g m n g { g p i n g o Ã u Ã g g k h g g f n g
Hizmet c n c p " o Ã v g t k p k p " j k p o g ' m w g n w p v o f d g ' m e g f
o Ã v g h i z m e t e k p c " , t , n g o c " u | , o q o p p n , " q n f B e m m " g m g d v j n c " v
sisteminin i g p g n , " g a n k o , n f u g , " i 3 4 u v g t k n f k k " i k d k f k t 0

D g m n g o g " j c v v , " u k u v g o n g t k l u y f r u g ' d i s i p l i n i n v e " u Ã c { t , n o c q " n u Ã t m g ' f e Ã t v g g t o g g " n " d k n g g p " d w n f w 3/4 t o n e l m v c f , d k n g g p k p " f , , p g f o c n " g d g k p i k g ' c c p " c j n d k v ' , g " v u l g u m v " x g " c k ± k p " d g m n g o g " j c v v , " u k u v g o k p k p " 3/4 | g n n k m n g t f w { w n o (Ramanufthy, 2007: 450).

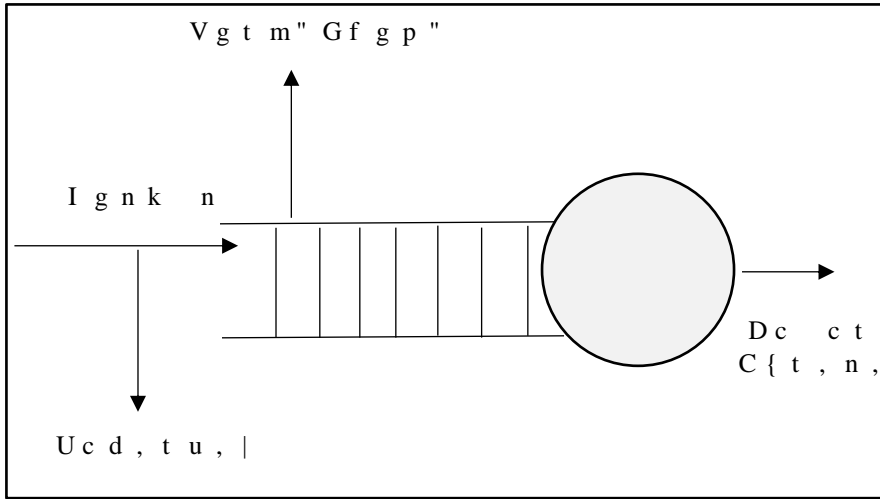
1.3.1. Gg n Uk Ã t g e k "

D k t " i g n k " m e t p p c i n p r p g p " " g j Ã | v o g g t v k ' n g t . " d g n m bekleme j c sistemihe dahil olur. Bu u Ã t , g g e r i k Ã t d e n i r k G g n k Ã t g e k . " j k | u k u v g o k p f g " d w n w p c p " o Ã v g t l g m u k Ã t k p e ' k u p k u p ' g d g g n ' k i k ± k p " i g n k n g t k p " | c o c p " c t c n , m n c t , p , p . " u c { zaman c t c n , b i l i m a n s t a n d a r t k u v c v k u v k m u g n " f c , n , o n c t c " v 3/4 | i Ã " d k t " c o r k t k m " f c , , " n f , c o " , u " k x u c v t g f o , g t " O i " 3/4 t g g n " k f g n g o Ã v g t ' k g g n s i s t e g k p g v x g k v n k " . O g m k g n g n f g g " i { g n g c { c " f c " i t w r n c t " j c n . k p f o g ' m { , { g o p g u m c ' k ± k p c ' t j e m w ' h i ' g t 3/4 t g p g r u p l a r g h a l i n d e g e l k n g t g " 3/4 t p g m v k t 0 ' k u Q w c w { q d j k m a n t i g n k f g n " g v t g k m " v g m " i g n k u n g t * k c h n 3/4 t i p 3/4 q l h) ! S i s t e m e 3/4 l e m o Ã v g t k n g u k p n ' m c { { p ' c f c " u q p u w | " q n c d k n k t 0 " O Ã i g n k " m e { p c m n , . " f c j c " d Ã { Ã m * [k , u n g o ' c u | d 1 p " u 4 w 2 2 ' : m c .

O Ã v g t k " m k v n g u k p k p " d Ã { Ã m n Ã Ã " x g " i g n k 3/4 | g n n k m n g t k p k " , m g " o i , g n k ' g n g n t k l n p g { g p " f k n c g t , " d k t f c x t c p , U k n u c v t g , o f g , " t i O k t f k k p f g " m w { t w m n i l e ' l g i l i c t , n m e d w n n g p o g . " m e ± , p o c " x g " c { t , n o c " q n o c m " Ã | g t

Kw { t w m n c " m k p k p n c m o v p ' t p k v w 3/4 p g l o w n g w o { g t f w g p c " g i r m e s i v e b e k l e m e y i i 3/4 | g " c n o c , u k a b i l l e m e t o l a w a k v f a d e e d i l e b i l i r .

Mw { t w m n c " m e t , n c k b e k l e m e y i A k a b u l g e t m e m p s k p e " s i s t e m e { t w i k t o g f g p " d u r u f u m a n o c q n d ' t ' c m " c C h t p f e n k t t h e y * i s e t 0 m w { t w m n c " m e t k n , m n i l e v e t p v e m k " i k l p t k p g c { p k e " c m c " d u v q n p " t g c v u o , d g m n g o g m v r g " p u " k x u c v | g i o g f ± g k p " c { (Mehri vd.c 2008: '3) f S i s t e m e o w f w t i k t o g f g p " c { t , n c p " o Ã v g t k p d i l e p " " i c 3/4 n u Ã k n p 3/4 g Ã e v g g " t i n k " d g m w { t w c " i k t o g { k " i 3/4 | g " c n u Ã t , g c A p k e v c g n t " k v e r i n j g o n k n p g " p g v c c t u c " m w { (Dombachlerwe Lennu g a s e f 2010: 79).



g n k m { t w m n c " M c t , n c c p " O Ñ v g t k n g t k p " © ± " H
 Kaynak: Dombacher ve Lenaugasse, 2010: 79

I g n k n g t k p " f y v g t p k p i k g n k m " | q n f w p b e k l e m e , p , p " j c v k u " v g o n g t k " k n g " ± q m " u , m " m c t , n c , n o c o c m { c p k " o Ñ v g t k " i g n k n g t k p k m n " g v o c p o b j e n g e n i v i l e v g u c f m c t , n c , n o c m v c f , t 0 " O Ñ v g t k " i g n k n g t k p k p k m k p " d k t " q n c u , n , m " D g m n g o g i ş t e n j l e r i n d e y e t e r l i v e r p o c n , i o g x e w v " f Ñ k " g i f k n l e P ö i n g t i p p k p " w n f o t p " c C i n e m e , t " * 2004: 603).

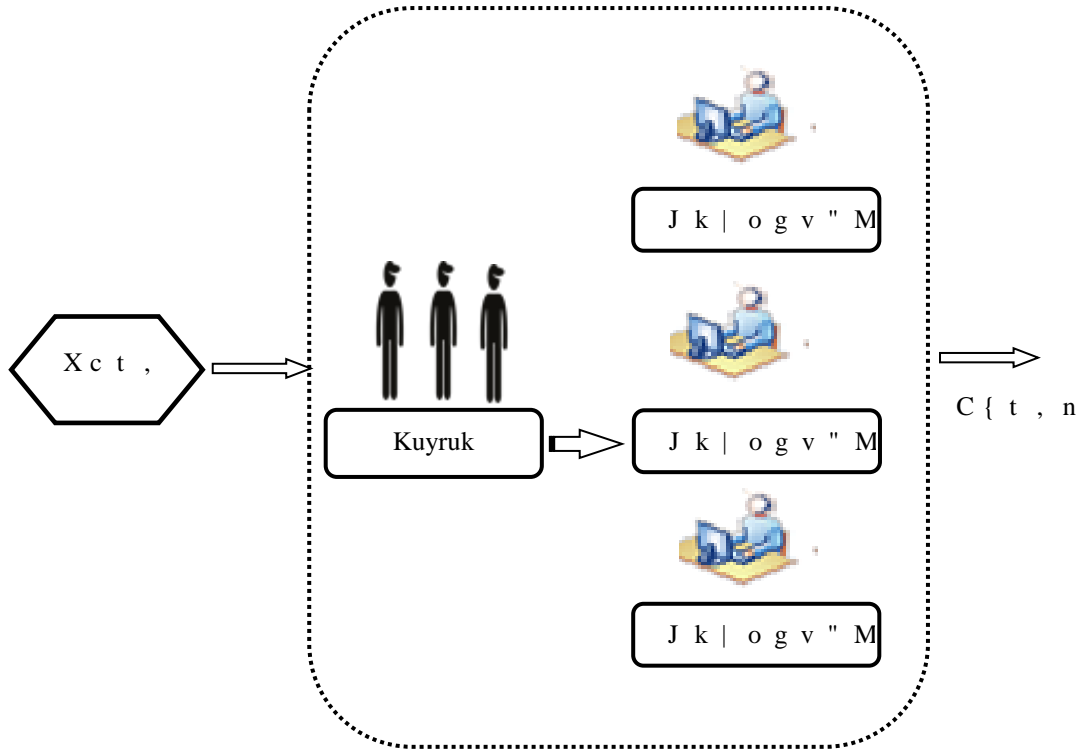
1.3.2. Hizmet U Ñ t g e k

Hizmet u Ñ t. g " e j k k | o g v k " Ñ t g v g p " o g m c p k | o c f , t 0 " j k / o g v f " g n p c k p t c 0 n " , V g m " m e s i s t e m l e r e , ö t g " i n d e m ü , p p t i f v g p " h c | n c " d w n w p f w w " u Ñ q m " g o n ö g i t i m a t " n o l e g u n g " p k | o c n e c q t m " " n f c g p p c k n t m u k u v g o n g t f g " m c p c n " f Ñ ö p a r a t e k k a n ' a l l a r ö { y a , d a ' b j r b k r i n i o g v k " v c o c o n c { c p " x g " h ö s e r i k a n a l l a r ö ' d j k k ± | k o o g k v p " f u g w p q c n p c " d k n k t 0 " s i s t e m l e r e , ö i s t a s y o n d a n i s t a s y o n a ö y a d a ö ± q m " c c o c ö n c , f " , v e k l i n c * " G m c n i g ¾ | . ' 2013: 15-16).

H c t d m n n " g o s i ş t e n j l e c i n d e h i z m e t d k t k o n g t k p k p " u c { , u , " i ¾ t g " m c t , h i z m e t o g n m c p p ' k h | c o v c i m n c g u h k p n , f h g n c p R e n d e r v e n c d k n Stair, 2016: 640):

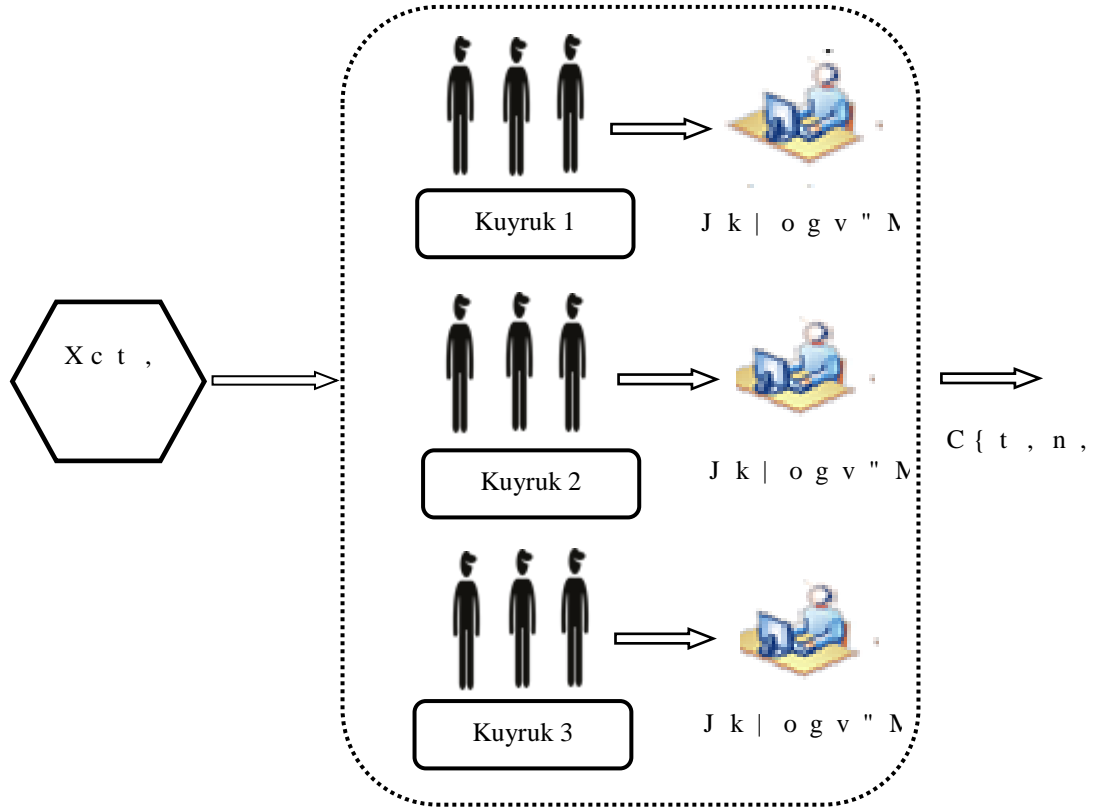
É Tek Kuyruklu V g m " M ð p ç n g y " O g m c p k | o c u , "

É Tek Kuyruklu Paralel M c p d k n , o " g v " O g m c p k | o c u ,



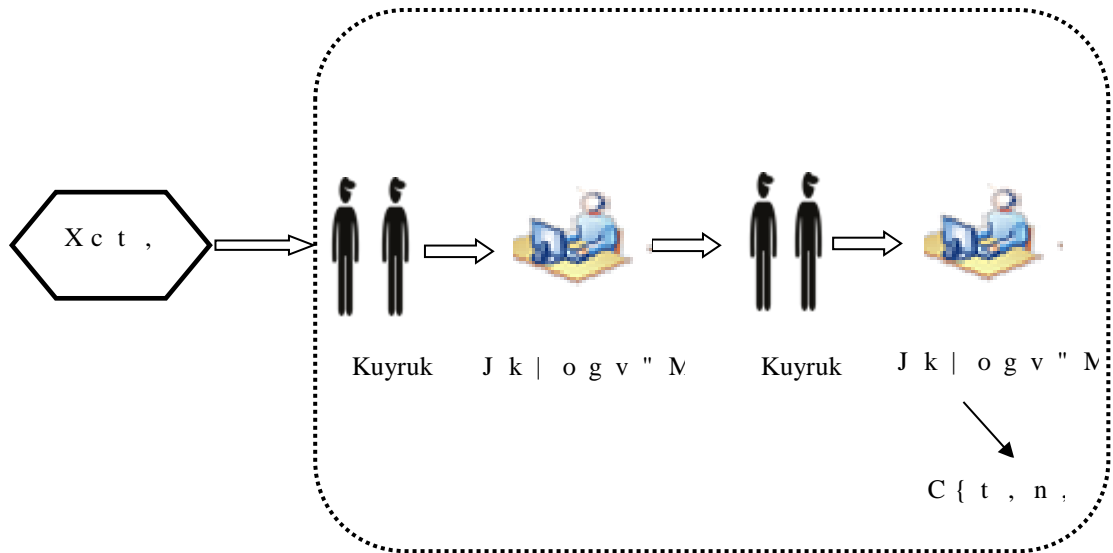
g n k t k Kuyruklu Paralel M c p H i z m e t , O " g m c p k | o c u ,
 M c { p c m < , 2008; 16 o c |

¥ q k u y r u k l u p a r a l e l m c p h i z m e t m e k a n k / o n d a h i z m e t d k t k o , " b i r d e n { , u ,
 h c | n c g f n d e n i 0 " % t ã n f ã ã ã v g h e t k j k | o g v p " , z o p ã p f i g " c { t , "
 m w { t w r v e " d ¼ k n l g r e b i g m ç p c n " ¾ p ã , p f w g t w m . ¥ q m u y r u k l u
 p a r a l e l m c p j k h o ğ v " o g m c p k l a r a k d k u t , ç k t " ¾ t g " r c t c n g n " d k
 d w n w p f w w " o c t m g v n g t f g " ¾ f g o g " { c r o c m " k ± k p
 v e r i l e b i l i r (A n i y e r i v e N a d a r , 2018: 3).



g n k m 'Kuyruklu Paralel Mc p Hizmet, O'g m c p k | o c u ,
 Mc { p c m < " [, l a o c | . " 4 2 2 : <

Serim c p j k h o g v " o p f n c p c o g m k u Ñ n f Ñ Ñ d k k d k , " j u k { o
d k t f g p " h c | , h i z m e t d k O K O Ñ g v k p k p " j g t " d k t k p f g p " u ,
 bir hizmet m c p c m , w p t p w Tcco { k t t , " f k , # k o p " i g n g p " d k t " c t c e
 u ¾ m Ñ n o g u k . " u q p t c " c t , | c p , p " v g u r k v " g f k n o g
 c c o c n e t f c s e r i ' m i c g p c j o n g u , k " g v " o g m c p k | o c v e r i l e b i l i r " ¾ t p g
 (Ramasamy vd., 2015: 356).



g m k s a r i ' M c p d H i z m e t , O ' g m c p k | o c u ,
 M c { p c m < 2008; 14 o c | . "

1.3.3. Kuyruk Disiplini

D g m n g o g " j c v v , " u k u v g o n i l e i t g k r p g f p g " o j A h i z m e t t v k ' n e g n t
 m e p c j n e , p p i c k " g u c u n c t c b e l i n e y e n d i s i p l i n e l e r ; k t n m n ' i e g a n g p p ' k ' h m " j
 u q p " i g n g p " k n t g e l e j i z m e t k u y r u k ' d i s i p l i n i x g " ¾ p e a i g n k u y r u k k " j k |
 f k u k r n k p k " g m n k p f g f k t 0 " D w " f k u k r n k p n g t " w "

n m " I g n g p " n m I n F i r s t O u t F I F O C D w ' t r i f w H k w m ' v f ' k u k r n
 u k u v g o g " j k | o g v " c n o i c g m k k ± " k u p , " t i c g m c g t p , " p o c A " i v ¾ t t
 j k | o g v " c n , t 0 " U , t c " ¾ p e g n k k p g " i ¾ t g " u k u
 c { t , F r k , t g 0 " f k u k r n k p n g t g " i ¾ t g " k f e k u y r u k " c f k n
 u k u v g o n g t k p f g i z m e t d i s i p l i n i d i m T a k s i ¾ r e s v A q t g p p ' " m w { t w m n
 m w { t w m " f k u k r n k p (A u g u s t i n e , 2013 : 19) " x g t k n g d k n k t

Son G g n g p H i z m e t G m ' (L a s t I n F i r s t O u t - L I F O) : D w " m w { t w m " f k u k r n
 m w { t w m " u k u v g o k p g " , g k p " m u ' ¾ p p ' e i g g ' n j g k p ' o e g A " v e g n t , k t
 ¾ p e g " O A t v , g n t h k z m e t i j g | n , i l d e x k g t t " k n g o n g u k n p w { g t p w ' f w q p n " c
 p c f k t " q n w c o w p w " m x g ; v , p , p u " k ¾ p g o n g t , f u g n " o a n f
 D k n i k u c { c t " r t q i t c o e , n , , " { (L a r s o n p 1987 : t , p f c
 896).

Rastgele Hizmet Kuyruk Disiplini (Service In Random Order-SIRO): Bu kuyruk

f k u k r n k p k p f g " o Ñ | v c g d k p ¼ p t g , l o p k " u H i z m e t e g v e t e p " d i p e " h
o Ñ v g r a s t k g g g " u h e r k e k , g k t c v " x t g , n o c " q n c (A l - J u m a i l y , p c "
ve Al-Jobori, 2011: 11). O Ñ v g e t d k p u g , t | " p g u g e l e h i z m e t k l y k u g " t c
disiplinip k p " m w n u y g u n d u r (C a u l k i n s , 2 0 1 0 : 1 9) .

" p e g H i z m e t K u y r u k D i s i p l i n i (P r i o r i t y Q u e u e D i s i p l i n e - P R I) :

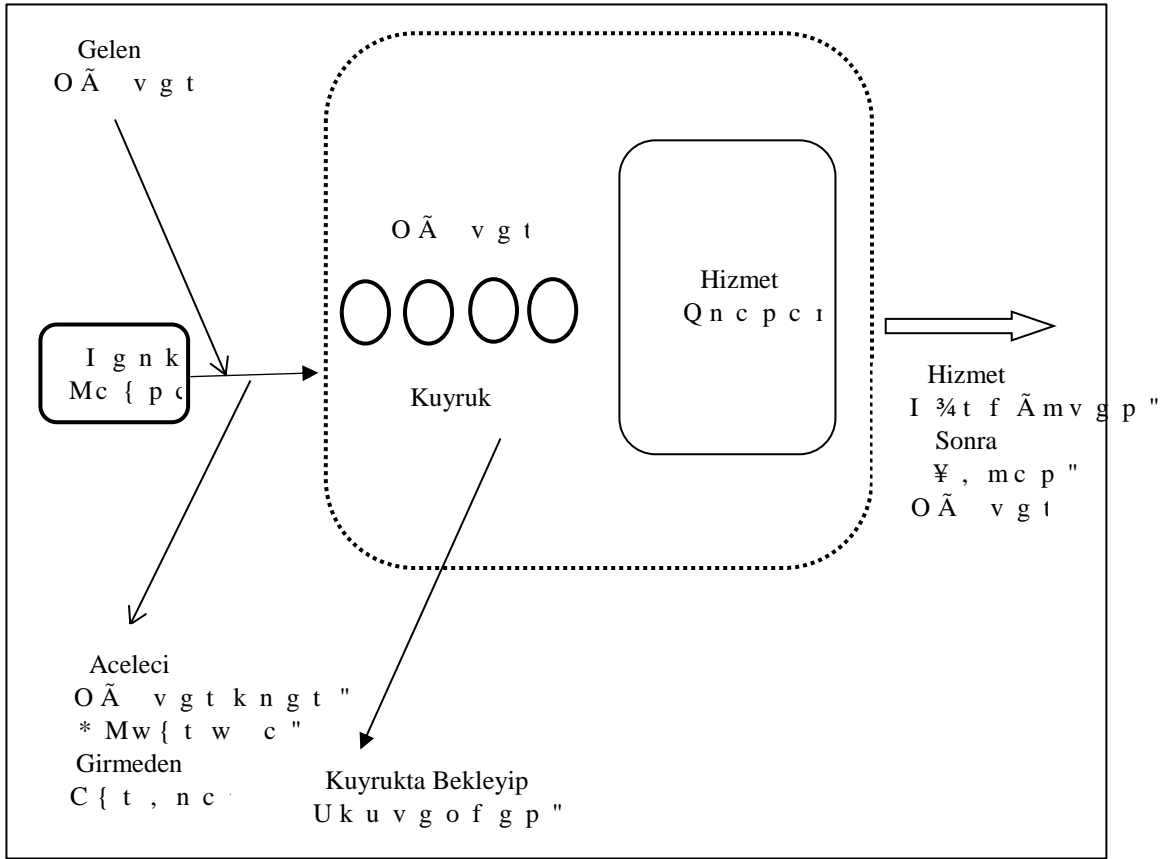
" p e g n k m n k k h i z m e t k u y r u k d i s i p l i n i , i k i g m k n f g v n c n p m , t f ¼ p t e w g o n . k " m n k " d k t " c
i g n o g u k " x g " m c p c n f c " j k | o g v " u w p w n c p " j g t
m q p w u w " o Ñ v g t k p k p " d g m n g v k n o g u f k , " t x 0 g " " D i v e t c
õ v c o " ¾ p e g (p r e e m p t i v e " p r i o r i t y s e r v i c e) k u y r u k d i s i p l i n i ö c f , " x g t k n
m k p e k " f w t w o . i n h i z m e t t a m f a n c l a m k " ü o Ñ x g g ¼ p e g n k m n l
u , t c f c " d g m n g { g p " f k g t " o Ñ c v " g ã v k c n o g " t ¼ p è ¾
olmayan hizmet (non-preemptive priority service) kuyruk disipliniö denir. Kuyruk
disiplininin h c t m n , " g m k n n u g k t u f v g g " o v k { p i " w i n g c p p g o n c " u k n g
¥ Ñ p d n g m n g o u g k " u j v c g v o k , p g " i g n g p " q t v c o Ñ t g b i Ñ k v g t
sistem parametreleri, kuyruk f k u k r n k p k p g " d (G m d e q 2 0 1 0 p 1 7 - , p " c {
18).

Kuyruk f k u k r n k p , k d p g " m h g t o g n ' , q m n , c u , , n , m n c L I F O p , p " f
f k u k r n k p k p f g m k " f c , n , d g m p " f c t { a p o , p " H K H Q c
d Ñ { Ñ H v Ñ t e " q t v c n c o c 1 9 7 8 : 2) : " c { p , f , t " * I k h h k p . "

1.3.4. U k u v g o f g p " C { t , n ,

O Ñ v g t k n g t k p " u d g m g o f u g k p u " v c g { o n , g n t , k p n f c g t m k . " " u q
M w { t w m n c " p h o t Ñ , b e k l e y i p b e l e t m e m e k k o n u s u n d a b i r k a r a r v e r m e k
| q t w p O Ñ f , v g t d k g n n g t g k o p g " k j v g o k p f g p t " v e o { n t g , m k o c " "
i ¾ t Ñ n f Ñ Ñ " i k d k " Ñ ± " g m k n f g " i g t ± g m n g o g m v g f

- < O Ñ v g t k n g t c . v , m w k t f w g o f g p " c { t , n c d k n k t 0
- < O Ñ v g t k n g t . " d n k w t { " t u w Ñ t a n g " a k i l i z m e t i n t ¾ g t n o " g f g p " u k u v g
c { t , n c d k n k t 0
- < O Ñ v g k u y r u k t a b e k l e y i p h i z m e t c n f , u n q v p c t p c " " u k u v g o f g p " c { t

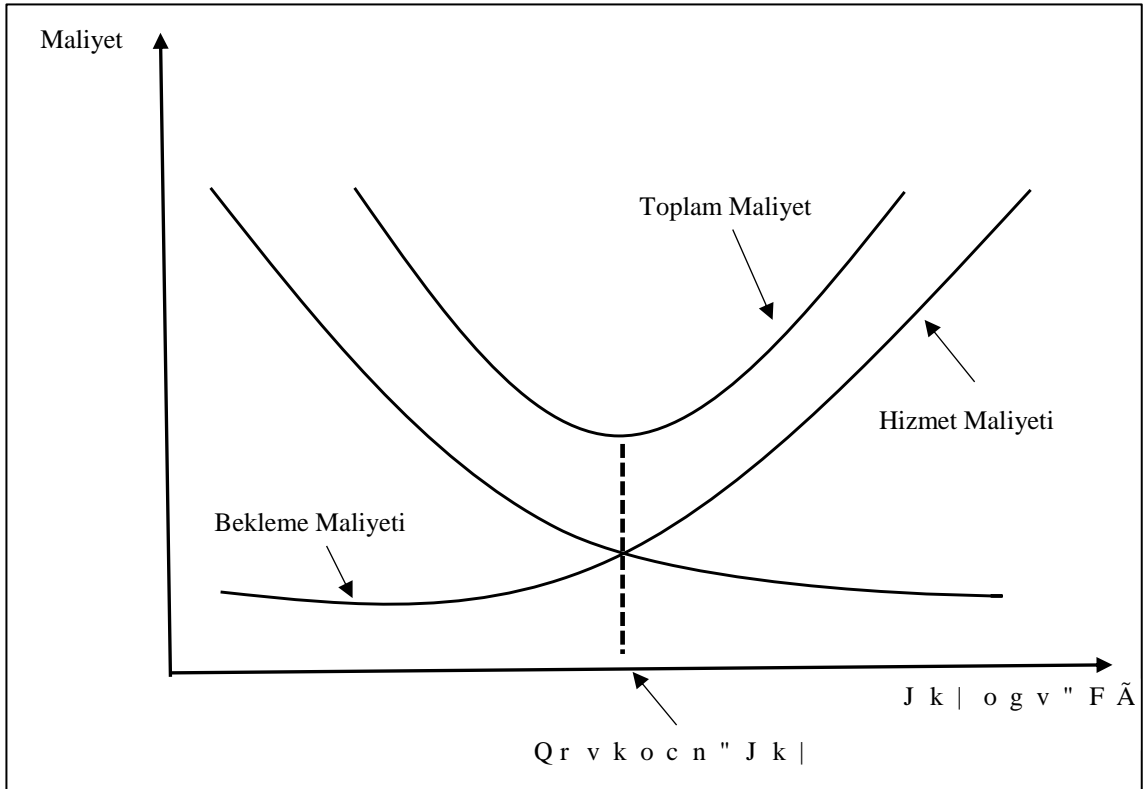


g n k 'u v g o f g p " C { t , n ,
Kaynak: C n c i 3/4 | 20 " 4 2 3 5 <

1.4. D g m n g o g Sİstēmderinde Maliyet

O' v g d k k t n " g d c n " x g { c " j k | o g v " c n o c { c " i g n f k m
c p " 3/4 p e g " v c n g r n g t k p k p " { g t k p g " i g v t k g t o l g m g t p f
o g o p w p k { g v u k u t n g " g v p j g l t g o p g " g t n c n o c { , " d g m n g o g f
edebilir. Bu durumda i n g , w o g v g t k r " v m b u , { k d g n f g v o g { g " d k t " o c n
{ c p o u " , " v g " { c p f c p " k o g v g o t g k " n { g 3/4 p k g p v k k h i z m e t t e d e g v o g d g
u c { , u , p , " c t v v , t , r " d a g c a k b u g k e z g l e " h i z m e t t e m e u p k e p n k , " " m , c u { c , m
c t v v , , k , m g v o g { g " g i r i t (A ' z a d , 2 0 2 0 (k 7) . g v " i g v k t

D g m n g o u g k ' ü v g v o k p ' f h i z m e t t e c v g t k o r g t x g h i z m e t t e v k g p t " k n g
d g m n g f k m n g t k " | c o c p " m c { d , " q n o c m g " v a d j g g " t ; { g 3/4 p k g n v k k
hizmet f A | g { k p k " c v v u , A t , g g u n k ' u p p k A " " A g m ' m f n A | o g { f (M e h r i v w v o c {
v d . , 2 0 0 8 : 6) . O r v k o c n " j k | o g v v " g f t b k k l e g e t e k l e d e n " ve hizmet
q n c p c m n v e n t a n p , , p , " p f c p " f d g v k p " g p h i z m e t t e f " A d n g n v k f v k t
(Kembe vd., 2012: 21).



g r k D r g ' m n g o g " J c v Q r , v " k U o k c u r v " g J o k k | p o f g g v " F Å | g { k
 Kaynak: Taha, 2011: 654

1.5. Bekleme J c v Modelleri

D g m n g o g " j c v v , " o q f g n n g t k = " u q p u w | " x g " u q p
 c { r . U q p u w / " m w { t w m " m c m a d e l l e k i , m g c r p k c " n d " g u n e n { g , a g , " p j , c p v " v d
 h c | n c " q n f w w " u k u v g o n g t " x g " m w { t w s i s t e m l e r i r c u k v
 k ± k p " m Q Å n v p t , k e l i m i n g p k k u u n c p t , " a f h i z m e t u n Å s t o l g p " Å u v g n " f c
 u y f w x w t u (U y r u n n 2 0 1 2 : 2 5) .

U k u v g o g " i g n k n g t k p " u , p , t m u ç q n f w " w g a d f g
 e d e r . N + I u c { , f c m k " i g n k n g t . " u k u v g o " v c t c h , p f c p
 d k t f g p " h c | n c " q n c d s o n l u g k a y g u k k a p a s i t e l i k k u y o u k f a z l a l l e r i g t f g "
 m w n n c p , n , t 0 " : 2 0 U U t p ç u n ç p . Å t g y k 8 " m e r s a n a y k v g u k p
 m a k i n e s i , d w " o q f g n g " ¾ t p g m " q n c t c n g " x w t , d p f g , d k r g p t k 0 " i
 k a b u l e d i l m e m e k t e d i r (T a h a , 2 0 1 1 : 6 7 2) .

D g m n g o g v " g j t k v k " k p e g n g p k t m g p " u k u v g o n g t k
 Å | g t k p g " d k t ± q m " o c v g o c v k m u g n " o q f g n " i g n k v k
 c p c " w p u w t n c t , p , " d g n k t n g o g m " k ± k p " ; K e n d a l l , " u g o

(1953) v c t f c h p, "p c l d l e " q n w, t t a h a s " O n F a L e p (1966) v c p t o c h , p f c p " f u g o d q n n g t t i k " S o g m a r a k p T a h k (1968) v c t c h h " p f u g p e d l e n e r e A d w i A p " n b i l i n g e n t (a / b / c) A d / e / f f K e n d a l l - L e e - T a h a s e m b o l l e r i q n w v w t . w n o w S i s t e m l e i l g i l i b u s e m b o l l e r , w p u w t n e t m e k t e d i k (T a h a f 2011: 666):

- c < " I g n k " m c { p c , p , p " d A { A m n A A
- a: J k | o g v " u f A t g , n r g , t d k p k p
- c: Hizmet veren kanal u c { , u ,
- d: Kuyruk disiplini
- e: Hizmet kapasitesi

G g n k h i z m e t u A t g e k p k " i 3/4 u i s e g e 4 g n (K o k a v d , 2018: 57): n c

- O < " R q k u u q p l © u v g n " f c , n , o "
- G m < " G t n c p i " f c , n , o , "
- P < " P q t o c n " f c , n , o "
- U: W p k h q t o " f * c v g , m r f , A d " g +
- GD < " I g n k u A t g g p k p " u i , g p g n " f c , n , o , "
- G: Hizmet u A t g u k p k p " i g p g n " f c , n , o ,

" t p g (M / M / 1) : (F I F O 1 O 1 n O d e l i n d e b i r i n c i v e i k i n c i M h a r f i , o A v g t k n g t l i s t e m e i g n k P o i s s o n k f p c k p , " n v e j k p o g v " u A u t v g n g t w p f u w " c p n c o , p c " . i S i s t e m d e g i m t a n g h i z m e t m c p x a t , F I F O k u y r u k d i s i p l i n i w { i w n c p o c m v c f , t 0 " U k u v g o g " i n g m g p f o A , v g t k l d k g m c { p c , " , y a n i s o n s u z k u y r u k k a p a s i t e l i x g " u q p u w | " b i r b e k l e m e " m c { p c j c s i s t e m i u 3/4 | " m q p v u w b w t . . " 4 2 2 : < " 3 : +

1.5.1. Sonsuz Kuyruk Mc r c u k v g n k " V g m " Mc p c n n , " D g m n g

Bu model, (M/M/1):(FIFO1 O 1 O g m n k 3/4 u i g S i s t e m i n k h e r l a n g i b i r | c o c p f c " v h i z m e t m c p r a n l n q d f w e k u y r u k k a p a s i t e s i n i n s o n s u z q n f w w " w o i f a d e e d e r . " B u m o d e l d e , { g v g t n k " x g t u k p i k p g " b o q g b e f k i g n k P o i s s o n v e h i z m e t u A t g u k p k p " A u v g n " , f a c t , e n c , " o j c k " | w o { g i F I F O k u y r u k d i s i p l i n i n e i 3/4 t g " { c r , n f u , 3/4 | , " m x i q A v d a m v d f , 2001: 7; K o k a v d . , 2017: 596).

c n o c m " k ± k p " ' u k a hangip ig d' io g nd" qise o j d n , o g v a' i n g c ± p g c t n g , m " j k | o g U " Ā c g t o θ t' m g u s i s t e m k p ĉ r g p t " ¾ t c p { g i m , n p g " t k p f g p " d k (Singh vd., 2012: 2).

Sistemde bulunan j k | o g v ü m ĉ c , k u n , r g " , i ¾ y e n i h i z m e t m k t c a p g " " g m n k p f g " k h c f g " g f d i m i k d e k u y r u k s i s t e m i n d e n i u k { d k t " b Ā o e p d w n w p o c u , " j n a n k p f w g o n u s w m l q ¾ ĉ (Kokar vd., 2017: 601-602):

- < G g ĉ c' y a n i " u k u v g o f g " d w n w , p d k p " o g Ā u " m g e t p u z h p ĉ d p ' u k u g " j g t j c p i k " d k t " m w { t e - w u n ĉ { u j , ¾ ģ | ĉ ' ö n g q v p " w m c w p " c o o g i w n " B u g d u r u k d a h i z m e t q t ĉ p ø { g " g k v v k t 0
- < G g ĉ ĉ y a n i u k u v g o f g " d w n w p j c k p | " o o g Ā ü v n g c t , p k c " , n p d ĉ p ± q m " { j c k | f o c g " v " m e p g c n k , v v " Ā k i d i n g e t m , c p ĉ ' h n c t , " o g q n c e c m v , t " x g " m w { t w m v c ĉ n , k - ü , q o n c c n e u c B u o v w , o t " 0 o d u r u m d a , h i z m e t q t ĉ p , p g j ' k v v k t

U q p u w | " m w { t w m " m e r c u k v g n k " ± q m " m e p e n n r c t c o g v t g n g t . " , (Kwembe, 2012: 20; Kokar vd., 2017: 601-602)

< Sistemin f q n w n w (m " q t c p ,

$$\text{---} \tag{12}$$

< U k u v g o f g u l u m Ā m a v g t e k " ; n , , "

$$\text{-----} \tag{13}$$

< Sistemde n s c { , o f Ā c v g t k " d w n w p o c " q n c u , n , ,

$$\text{\$ ---\$} \dots^a \text{ o Ā i s e} \tag{14a}$$

$$\text{\$ ---\$} \dots^a \text{ o Ā i s e} \tag{14b}$$

< Kuyrukta bekleyen q t v c n c o c " ö Ā): v g t k " u c { , u ,

$$\text{ž --- - ---\$} \tag{15}$$

< Sistemde bekleyen ortalama o \tilde{A} v g t k " : u c { , u , " *
 $\check{z} \check{z} - \check{z}$ (16)

< Mw { t w m v c " q t v c n c o c " d g m n g o g " u \tilde{A} t g u k " *
 + - (17)

< Sistemde q t v c n c o c " d g m n g o g " u \tilde{A} t g u k
 + + - (18)

< U k u v g o g " i g n g p " d k t " o \tilde{A}) v g t k p k p " d g (19) g o g " c
 "\$ - - — \$

1.5.3. U q p n w " Mw { t w m " Mc r c u k v g n k " M d M l e r p c n n ,

D w " o q f g n . " * O 1 O 1 3 + < " * H K H Q 1 P 1 \hat{O} + " y r u k m n k p f
 m e r c u k v g u l g h k , p m t r f p . Mw , { ' t w m p ' u m w | r f c w t k v g u k " u , p ,
 u k u v g o k p f g = " m w { t w m " m e r c u k v g u k . " m e p c n " u c {
 (Thomopoulos, 2012: 27).

1.5.4. Sonlu Mw { t w m " Mc r c u k v g n k " Y q M d M l e r p c n n , " D g

Bu model (M/M/c): (FIFO/N/ \hat{O} + "g m n i k 3 p u f v g B u r i d e l l e r t e m e p c n , " u c { ,
 d k t f g p " K h w d | t n w m f " , m t c r c i u g r v l g u k h a { p (Golub, veu Mc A f e e , w | f w t
 2006: 8).

1.6. D g m n g o g " J c v v , M w U n k n u c v p g , o n n e c p t ' k Q n f c g u , n , m " F c

D g m n g o g " j c v v , " u k u v g o n g t k p f g " o h \tilde{z} m e t g t k n g
 { c r , u , p , p " d k r O \tilde{A} p α g g u k ' h 3 / 4 p g k p n ' k d f g k m t n Q ' b g v e ' h j z m e t v , " u
 u \tilde{A} t g v n g u t c k f \tilde{A} h k " q n c d k n g e g k V e r i l e k i n d y e t e r s i z 4 v e y a b e l i r s i z p " f g "
 q n f w w " f w t w o n c t f c " k u | k o u g v v g " o p k \tilde{A} t i g g a n g k m k n q g o t c k m " ; n k g + t h
 f c , n , o n c t , p f c p " g p " \pm q m " \tilde{A} u v g n " f c , n , o . " R
 f c , n , o " * r O w m e n t e p 4 9 n , " t 4 ' 2 2 : <

V g | " \pm c n , o c u , p , p n ' v d n w n " a l p 4 , n \tilde{A} o p \tilde{A} p m ' g f R o i s s q n ' u o m \hat{c}
 f c , v e \tilde{A} s t e l f \hat{c} , i l e w { o i " w n c o c " k u l l a n , \tilde{A} n d \tilde{A} i p u l l f g c " , j i l c , n o m , p f c "
 d k n i k " x g t k n o k v k t 0

1.60 3 0 " R q k u u q p " F c , n , o ,

Poisson f c , n , o o c v H b S i m d o m D e B o i s s o n v c t c l g g p k c p k t k n q n w r " g p k u 3/4 p c g v o k n u k v k m u g m t a n e s i d i r . D w " , 3/4 p g o g l i n p c j l k p ; p s e b e p l e r i n d e n d k t k . " d k t ± q m " f q c n " x g " f g p g { u g n " q n c (Stigler, 1982: 33).

R q k u u q p k e s i l d i q n n u o n , d u p b e l l i b i r z a m a n o t , c n m e y d a n a f c g e l e n q n c { n c t , p " q n d e n u R q k u u q p " k l c c f , g b i r b i r i n d e f c " q n d c , o u Y a n i , b e l l i b i r z a m a n d i l i m i n d e o g { f c p c " i g n g p " q n c { , p " d i l i m i n d e o g { f c p c " i g n g p " q n c { f o d f p w ' k a b u l o e d i l i m e k t p d i r . d c , o Q n c { n c t , p " o g { f c p c " i g n k k b i r z a m a n d a k , m e s a f e , t u z a y n a l a m v c " g v e y a h a c i m o l a b i l i r * G t f q c p . " 4 2 3 2 < " 4 4 +

D k t " u c c v " c t c j r k , | o , g p v f " a m l g o p g m n l p c d k t b e l l i b i r n c t , p | c o c p " c i m a l a t s a n a y i n d e k u s w ' t n w " x g { c " j c v g c t n " , d " g A t " g f v c k m o k " m u d k t " ± c t , " o g t m g | , k g p t g k " n i g g p n " g d p k " t c " t A c t o g c v " k u o c " { | , c u o , c p , { c t c n c p o p q ' k u u q p n d 3/4 c t , p ; g m , " a q , n p c c t (H u n 2 0 0 8 : g) t k n g d k n k t "

R q k u u q p " f c , n , o , " c n f c p p , c " i n l g o p o c c m f g z a m a n d a k i t d ' k j k b f c , n , o , p , " d w n o c m " O r v k p c b g " m A n n , g p k d i p g m d c f o l a r a k f g k o k { q t u c " u 3/4 p q k u u q p v u f w c i g x m c k t o u n (G o c h e s n y , { t f w v d . , 2 0 1 1 : 1 5 2) .

Poisson dc , m , p " , x c t u c { , , g f b i d i n (O s g o b d , 2 0 0 0 : 2 3 - 2 4) :

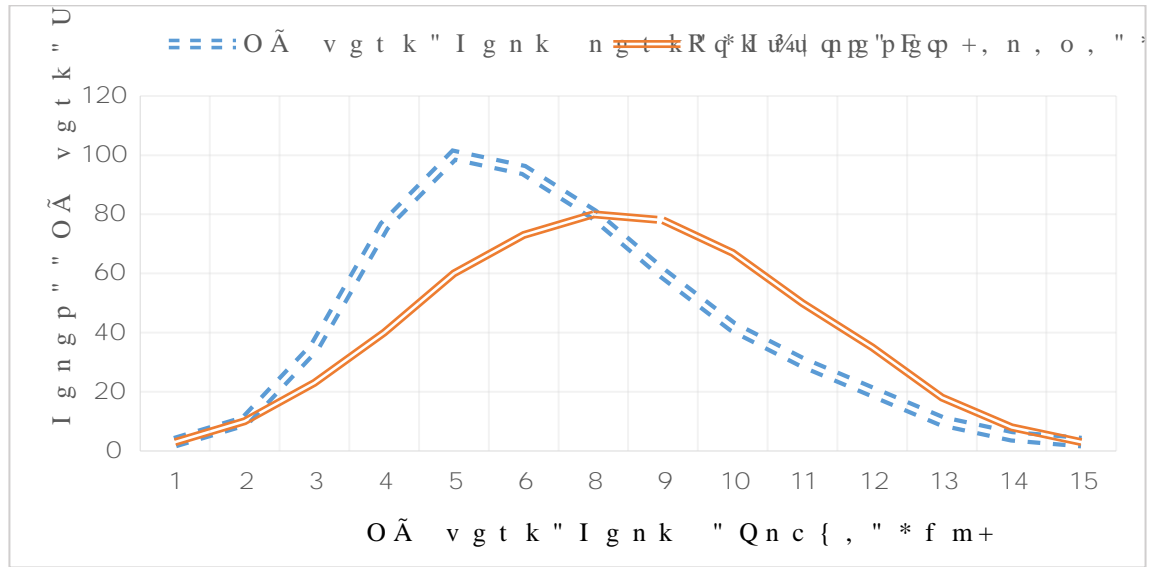
- < Belirlenen periyotta meydana gelen ortalama olay u c { , u , " u c d k v v k t 0
- < O A o m A p " q n c d k n g e g m " g p " m A ± A m " | c o c p " c t c
- < Q t v c { c " ± , m c p " q n c { " u c { , u , " k n g " r g t k { q f

Poisson da l, m, n olas, l, k m A v f o n k s i y o n u G k v 2 0) k f i n g ' 3/4 t A n f A A " i k (Uyrun, 2012: 20):

(20)

f c , n , o , p k , p c f v k n c q n u t c m " i 3/4 t A n g p " ; a n c { , i s e f q c n " n q i c t k v o c " v c d c p , " q n w r " 4 0 9 3 : o f k t 0

g m 0mf " bir bankadaki o Ã v g t k " i g sukq pn" g f k p k p ; oR' q k
 verilmektedir. R q k u u q p ", f c , n , o f p (") q t c p n c f n , c o , c ' t u f i , g u , 3/4 h t " c "
 konusu f c , n , o , , p p ' t i o t c n h ' k f c k , n , (Berhan, 2015: 68). o g m v g f k t "



g m 0mf " Bir Bankadaki O Ã v g t k " I g n k n g t k p k p " R q k u u q p " F c
 Kaynak: Berhan, 2015: 68

1.60 4 0 " © u v g n " F c , n , o

© u v g n " f c , n , o . " u Ã birgime benzeyen k t c " f q u c t t h e ' t q p
 o g { f c p c " i g n o g n g t k " e t c u , p f c m k " | c o c p " c t c n ,
 | c o c p " c t c n , , p f c " d k t " q n f Ã , Ã h " o g g f d p e d " m i n g h
 k u v c v k u v k m u g i s a d ' m q n { c r t c t m , " p l " c o g { o f u c , p c " i g n o g , n g t k "
 Ã u v g n " q n c * t J c c m " c f + d 0 3 , 4 n 2 , 2 3 h d k m n g o g " j c v v , h i z m e t t q d n g
 u Ã t g n g t k p f g m k " d g n k t u k | (Newbold, 2009: 234) n " f c , n , o r

© u v g n " f c , n , o , p " , x f c t (Balakrishnan, 2019: 21):

< B g n k t n k " bir kerè daha c q { , v p { c " ± , m o c u , p n i n ' m c f c
 f c , n , o , f , t 0

< Olay, sabit d k t " q t v c u n Ã t o g m ' n j k , " | x f g c " d c , a r . u , | " q n c t

© u v g n " f c , n , o , p " q n c u e , b i n i k i m l i ' f e q , f o n k s i o n u m " h q p
 G k 2 h v e 6 " k 2 2 d e k i " k d k f k t " * " | Y n g c n p k . m " 4 x 2 0 3 7 2 B 3 " | 3 g 8 p

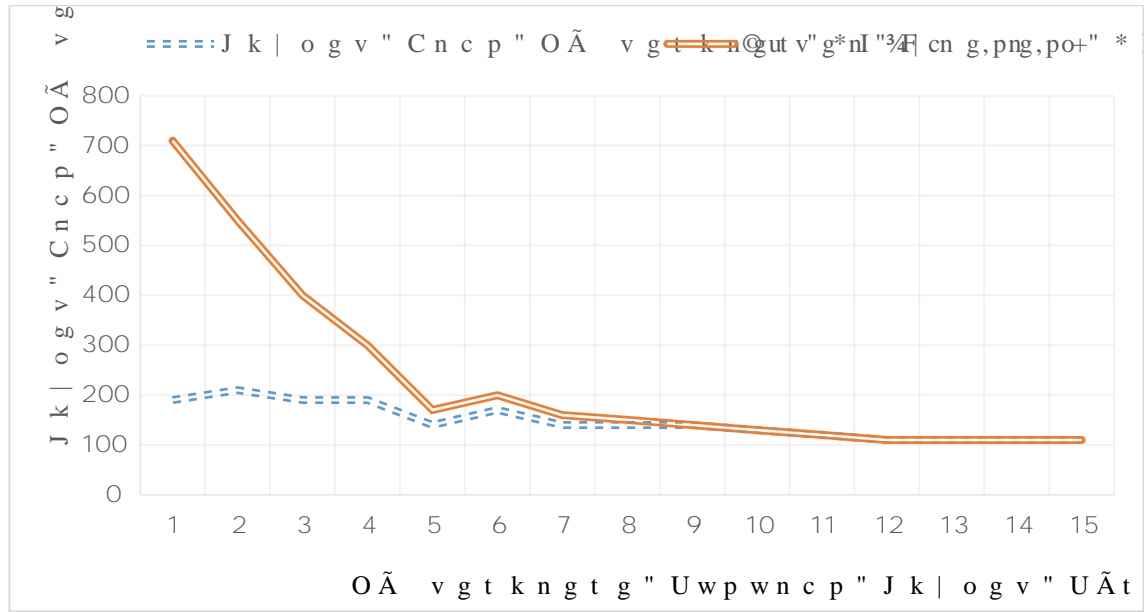
..... (21)

/ ' i (22)

© u v g n " f, P q k, unu, qop, " p f d k n, k n, m k, u d k k r k g q t n f c, { t, O p " i g t q n c u, n, , . d' n q c t p v " c d k c t o ' c u R q ' k u u q p " f c , n, o, p c " w i g t ± g m n c g t c o u g, n p g f t c k m k " v | c n l a ' o p, u p n. ' c l p' " d k t " A u v g n " f c i ¾ | n g p g d k n k t " * P g y d q n f . " 4 2 2 ; < " 4 5 7 + 0

D g m n g o g " j c v v x g " o f k g g n ' g t d k p f e g ' m " i n d e ¾ A u g w g k m " f c , d n w " o m c " f c t " , h f c { f, o j n c, d, m, z n u c g p n k k f k t 0 " J g t j c p d k t " u A t g ± " i ¾ | n g o n g p k t u g . " v A o " j A k u | v o g n v') | u A t c g p o l a u , n, m n c " o d c v c p " d c n c t o . " u q p " x c t , " x g { A | g t k p f g p ' e p g p ' m i c g e v k k p u f v g p n' " g f v c m k, n g, p o . g k d w " ¾ u A t g m n k " q n c u ' Y g n m ' h m f n c t c p t, p g 4 2 3 p l e r i i i 3 g n k g n k t " c | c o c p , " A u v g n " f c , n, o c " u c p k o A d k i g n t e j b i k i n e g v " d k 2 ; < 2 4 o f g " i g n f k k " x c t u c { , n u , p 0 " w " c p " u c c v q n c u, n, , . " u c f g e g " w " c p f c p b i r l o n k s i y e n d u r v e g o h m c f c t o A v g t ; k p 2 k i p g " i g k k p < f 2 g 4 p " " k x n g g " " 2 2 ; ; < 4 8 " c t c u , " i g ± g e t k i l e n m e z * G t f q c p . " 4 2 3 2 < " 4 5 + 0

g m n o f B i r ' B a n k a d a k i j k | o g l e r i i n u A u v g n " f c , n, o " i t c h k J g u c r " c ± o c f c p . m' c r f c c t t c " o v A t c v p g u t h k g n t g k t p k g p " " k j v k { c ± " i g v k t k g m o g g " k u A t c t m n , f n w, t m " o i' ¾ u v g o' A i k ¾ | o n' g k p' v j p k " | o g v ' i t c h k k p k p . " d g m n g p g p " A u v g n " f c , n, o " i t c h k (Berhan, 2015: 68).



g m n o f B i r ' B a n k a d a k i J k | o g v k " p U k A t " g A u v g n " F c , n, o " I t c h k Kaynak: Berhan, 2015: 68

1.6.3. Weibull F c , n , o

Y g k d w n n , " f u c v g , n n " , f o c , , n , o " c k n g u k p f R g p q " h g n i c 4 p " Y c n q f f k " Y g k d w n n " v . W e i b u l l f , c p f , c n p j o c w t w p m o w c v w b " u A k n g " j c x c " v c j o k p n g t k p f g " u , k m u n v , g n o n " c o A n j w g n p n f c k p u , k e t o c b i r u k u v g o k p " m A o A n g c t v h k q h t " o m q { u , g e n e l o l a r a k p o t a y n k | " g i g t ± g m n g o g f g p u " A 4 p g e u g k u p k g t d k g { p k h " g c g m , " k n w k p c p , n , t C c p n c o f c " t k u m " c p c n k | k p f g . " c m v A g t n c a , p h k n k n o k t c u v n c o c m " C A o m A p f A Y g o k d w n n " f c , n , o , p , p " o d k n k o n g t k p f g " w { (N a j m a l d i n , 2 0 1 6 c 3) . , " o g x e w v v w t

Weibull n n " f p c , p g m (k) a , g " 3 4 n ± p a r a m e t r e l e r i o l m a k A | g q t n g c " u , n , m { q w f o n k s i y o n u v e b k t k m k o n k " f c , G n k v o 3 i k h n a " g * i n 4 6 4 k p o f g w k n " g i b i d i r * o c n " x f = 0 . F q 2 c 3 p 4 < c " j 3 k 6 p : " x f 0 . " 4 2 3 ; < " 5 3 ;

$$- \dots i \dots \tag{23}$$

$$/ \dots i \dots \tag{24}$$

M P E " D " N O O

D G M N G O G " J C V V K " O Q F G N N G T P F G " U O O M

© t g v k j o k | x o g g v " k n g v o g n g t k p f g " h k | k m u g n " x
 f g k m g p " x g " m e t o c , u k m u " v d g k o t " " { { 3/4 c p r g , v " k i o 3/4 k u p v k g p t " o 3/4 g p u g k
 n g v o g n g t f g " m e t , m , c u m a t e m a t i k s e l p r o g r a m l a m a { o 3/4 p g v t g k o p n " g d t k
 ile ± 3/4 | Ñ n g p l d k n k ' t d Ñ C Ñ m " x g " m e t o k m e s i n d e m a t e m a t i k s e l n g o n g
 p r o g r a m l a m a { 3/4 p v g o g g n t " k d f g v g t e n Ñ " u e ± 3/4 Ñ f o c o c o c m v c f , t
 m e t , n c , n c p " m d e f g c e k , v a m i n , r u m , q v d " n g o p m g p " ± q m " h c
 j g u c r n c o c f o r l u k l a r k s e b e p o n m o , c o m v c f , t 0 " C { t , e c " o c v g o c
 f w t w o f c p " o l a h a k t m m t , w n w p e c " u k u v g o k p " i g t ± g m
 k a y b o l a b i l m e k t e d i r . D k t " d s e b e p m i s e " u k u v g o k p " m e t , n c v , ,
 m a t e m a t i k s e l p r o g r a m l a m a { 3/4 p v g o n i g 3/4 u k v ' g k r k g n o g q " d n g m a k k ' p c k ± , m m
 k o n u s u n d a y g v g t u k | , " t B O c v n b u n a u b e n f e r s e b e p l e r , s k o Ñ n a m u k f q p g v o g
 { 3/4 p g v k o n g t k p k p " m e t , n c v , , " r t q d n g o n g t f
 ± , m e t o c t h o v t e f c u 360 . p . " 3 ; : 8 <

U k o Ñ n k m g d u d Ñ c t | g . b i l g i s y a r . { " c t f i l e o q f g n n g p o g m v g " x g
 q n c { , p " d g n n k " c t v n c t " c n v , p f c " i 3/4 u v g t f k k "
 ile k n i k n k " a r a f l a r { k " k f m " " m u r u m l a k m k m " , u , p f c " u k e l d e v g o k p
 e d i l e r e k i 3/4 | n g o n g p g d k o Ñ g m v g d i p x f g c " p " g n f g " g f k n g p "
 v c u c t , o , " x g { c " g p " w { i w p " a b d i m e k t e d i r " (N a f e s , 2 0 1 7 ; 3 p , p " u g

2.1. U k o Ñ n c u { q p " M e x t c o , "

n g v o g p k p " g n k p f g m k " m e { p c m n c t , p " x g t k
 r t q d n g o n g t k p " ± 3/4 | Ñ o Ñ p f g ü l g o Ñ n k n u k (B e a p e s t i c k v d . c t f c p
 2011: 93).

V c j c ø { c " i 3/4 t , g " g u k g Ñ n g ü { x c p t " q n c p " d k t " u k
 { c r , n c e e c m " g p " k { k " g { f k t 0 " U k o Ñ n c u { q p . " d k n
 f c x t c p , , " j c m m , p f c " i g ± g t n k " d k n i k n g t k p " v q
 (Taha, 2011: 715).

J c n c ± ø , q " i v 3/4 t p g " o u k p o Ñ n c u { q p . " i g t ± g m " d k t " u
 u k u v g o k p " k n g o g u k " k ± k p " i 3/4 | " 3/4 p Ñ p g " c n , p c p

U k o Ñ n c u { q p . " f k p c o k m " d k t " u Ñ t g e k " v g o u k
 { c r , n o c u , p c " q n c p w e { m i " w p e " d n k t t 0 0 q " d f g p k p " c i o g r e k v k t
 d c n c p i , ± " m q w n n c t , p , p . " r c t c o g v t g n g t k p " x
 | c o c p " k ± k p f g " u Ñ t g e k p " f c x t c p , , " d b e l i n l i b i t n g p o
 | c o c p " f k n k o k p k p " d c n c p i , e , p f c n ' w u n k u D a l g a n k p " 0 n
 u q p t c " u ¾ | " m q , p w u w " g f v g o g k p n g g p g n " g d t c , o n , " d k n i k n
 f k n k o k p f g " u k u v g o k p " f c f x g " c m w n n q p p , " n v , Ñ t t e v G p c m i ' l
 g f k n g p " , g m p " w e n c p c p " | c o c p " f k n k o k p k p l e y e m q p w p
 f g k m g p n g t k p " f g c g t l w g ' t g k f f k k n t g o p " D w w | " w p Ñ t w g n c m k
 tekratlanabilir * C { f , p 11): 4 2 2 9 <

U k o Ñ n c u { q p w " m w d e ¾ p c g p t c k p n " g d p k " t ± " ¾ k | Ñ o s o n g o u g d a p " w { i
 mevcut duruma i ¾ t g " d a l p a f a z l a k v g n f g " g v o g u k " o Ñ o m Ñ p f Ñ t 0 " U
 k n g " d k t " m w n n c p , e , . q " n d f k w m i u c Ñ t ' g k k p ü Ñ Ñ g f g ' i ¾ p m
 g m k n f g " m w n n c p , e , . " d k t " u Ñ t g e k p " v Ñ o " x g t
 i ¾ t Ñ p v Ñ n g { g d , 2 0 1 0 (k 9) . " * O q t g p q " x f

U k o Ñ n c u { q p . " m e t o c , m " u k u v g o n g t k p d ' v , c m u c
 o q f g n n g m d p ' w ¾ w p g c " q n f w m ± c " ¾ p g o n k " x g " g v m k n k
 w " g m k n f g (L a v ¾ v e M o C o m p a s p 1 9 8 7 : k 3 8 ; B a n k s v d . , 1 9 9 8 : 4 ; R i v e r o , 2 0 0 4 :
 2 ; R e y n o l d s v d . , 2 0 1 0 : 6 0 8 ; I Ñ n . " 2 4 ; P o p - A n d o n o v v d . , 2 0 1 2 : 4 ; U c { i , 2 0 1 6) : " 4 2

- < M e t o c , m " u k u v g o n g t k p " c n v " u k u v g o n g t k p
 k p e g n g o g m " k ± k p x " g { c r e , n n c p " d a l e g g i t i g r . { " m q n t c k p " c m n ,
- < ¥ g x t x g u " g q t i c p k | c u { q p g u k 6 Ñ n k e i n d e l e n b i l i r k n g t k p
- < Q n c e c m n c d e r , { " g y p e k j " o v k c p u l g c ' t r , q o m n k c v t k m f c a n p e ' t ¾ p ' e w g ' i w
 eder.
- < C p c n k v l a r n f " q u q t p w n ± c t 0
- < A p c n k v k m " ± ¾ | Ñ o " { ¾ p v g o " d k n k o n M o d e r n k p " i
 u k u v g o n g t " * h c d t k m c . " j k . + " o g n f w m i c Ñ v Ñ c t ' d k
 { c r , f c " q d w p v n c w t ' , k p ± k , g v m k n w g c l p o ' m g k t o Ñ i l e c u { q p
 elde edilebilir.
- < M n c u k m " ± ¾ | Ñ o " { ¾ p v g o n g t k p k p " m w n n c p , n c
 ± ¾ p Ñ p f g " q n f w m ± c " g v m k n k f k t 0

- < U k u v g o n g t k p " o q f g n n g p o g u k " u Ã t g e k p f g " i m e t c t " x g t k n o g u k p k " u c n c t 0 "
- < U k u v g o k p " f c j c " i g p g n " x g " u Ã t g ± " q f c m n , " w { i w n c p c d k n o g " q n c p c , " x c t f , t 0
- < U k u v g o " ã g g k k p k " g f g p g o g n g t " { c r o c " k o m p c c o c u , p f c " q n f w m ± c " ¾ p g o n k " x g " g u p g m " d
- < F g k m g p n g t " c t c u , " g v m k n g k o n g t " q t v c { ã | g t k p f g m k " g v m k u k " c p c n k | " g f k n k t 0
- < Yeni stratejiler, operasyonel prq u g f Ã t n g t . " m e t c t " o n g m c , p . k ' ¾ t i ã v u g n " r t i q u t g f g ã t " n u g k t u " v x g d o k . p " u Ã t g i g n g p c m u c v , n o c f c p " k p e g n g p g d k n k t 0
- < [g p k " { c | , n , o n c t " x g " u k u v g o n g t . " m e { p c m
- < Q n c { , p " p k ± k p " { c " f c " p c u , n " o g { f c p c " i g c o c e y g n v " g f k n g d p k n " k q g i b i s t o d a r g { c q n w m u ç | c d k n k konu su bw " f w t w o . " ¾ | g n n k m n g " { g p h " c u f k u n g d n g t

U k o ã n c u { q p w p " { c p c p u ç l e ç t q , t p v , c p { c " ± , m w d k n g g m k (G n g c f t k ± c { . ; M e r e z o v d . , 2 0 1 0 : 1 0) :

- < D k t " u k o ã n c u { q p " o q f g n k p k p " q n w v w t o c u . r c | c t n c p o c u , " x g " c p c n k | k " k ± k p " d k t " o q f O q f g n n g t . " ± q m " u c { , f c " x g t k " i g t g m v k t k t
- < O q f g n k p " m w t w n o c u , . " ¾ | g n " v g e t ã d g " x g " g
- < U k o ã n c u { q p " o q f g n k p k p " i k t f k n g t k p k " q n v v c p , o n c p o c | u c " o q f g n . " i g t ± g m " j c { c v , p " durum ise i n g v o g " k ± k p " { c p n , " ± ¾ | ã o " { q n w p c demektir.
- < J g t " v g u k u " x g " u Ã t g ± . " u k o ã n c u { q p " o q f g n k ± g t g p " f w t w o " x g " m q w n n c t " u k o ã n c u { q p C { t , e c " t c u v i g n o g m q n ç t q a m p f g k g t " u k u v g o " q { c r , n c p " v ã o " f g p g o g n g t . " c { p , " u q p w e c " w
- < J g t " u k o ã n c u { q p " o q f g n k . " m g p f k p g " ¾ | i ã d c h e r k a n ' g i b i r p r o b l e m i n ± ¾ | ã o ã p f g " m w n n c p , n c o c | 0 "
- < U k o ã n c u { q p . " r t q d n g f g g t k n p " f e k t ã m ' g ± ¾ | n ã i g n k v k t k t 0

Uk o Ā n c u { q p " k n g " w n c , n c p " u q p w ± n c t , p " u q p w ± n c t , p c " i ¾ t g " h c t m n , n , m." i ¾ u v g t f k

2.2. Uk o Ā n u n i M w q p m c p A l a m l a f , , "

D k n i k u c { c t " Ā | g t k p y o n g a f , s { s t Ā n l e Ā n v Ā d e l e m e s m i l e u k o Ā n i l g i l e n i r . S i s t e m , r n c p n c p o c m v c " q n c p " { c " f c " i g t ± g m v g " x d k t " u Ā t g ± " q n c t c m " f Ā Ā p Ā n g d k n k t 0 " K t v c m f o " ¾ t p g m n g t " C a r s o n k 2 0 0 4 : 1 3 ; n P a r l a r , 2 0 0 8 : 1 4 1 0 ; * M e d e i r o s v d . , 2 0 0 8 : 1 5 2 6 ; B r e n n e r v d . , 2 0 1 0 : 3 0 4 ; P a u l v d . , 2 0 1 0 : 5 6 0 ; G u p t a v e G r o v e r , 2 0 1 3 : 4 6) :

- < © t g v k o " u k u v g o n g t k p k p " v c u c t , o , " x g " c p c n l
- < Dinamik sistemlerin incelenmesi,
- < D k t " d k n i k u c { c t " u k u w g a i k v p g k o p " g t d k | p , k p , " d " g x g k " f
- < [g p k " d k t " c u m g t k " u k n c j " u k u v g o k p k p " i g n k
- < D k t " g p x c p v g t " u k u v g o k p k p " u k r c t k " r q n k v l
- < [g p k " d k t " c n c p f c " { c v m e t c u t s i s t e m i n c v t e a t e , t " , x o g t k n o g
- < Q v q { q n n c t . " j c x a k n o g n o a g t k i " k d l g " w g o t q ö x g f
- x g " v c u c t n c p o c u , .
- < D c p m c e , n , m " i k d k " h k p c p u e n c " p x g k | g k m " q p k q o g k n
- d g m n g o g n g t k p " k { k n g v k t k n o g u k
- < Hastanelerf g " j c u v c n c t , i p i l e a c i l s e r v i s " b i d i n l e r i m i n g a n a l i z i n v e t
- k { k n g v k t k n o g u k .
- < H e | , t " { g o g m " t g u v q t c p n c t , . " r q u v c p g n g t "
- f g g t n g p f k t k n o g u k .
- < n g v k k o " u k u v g o n g t k p k p " v c u c t , o , " x g " i g n
- < G k v d k p n " a n c " x g " m e t c t , " c n o c " w { i w n c o c n c t ,
- < I g o k . " m q p v g { p g t . " x k p p " ± " g x g k " m d t o c " p w n " a , n a , t p
- < V g u k u . " f g r q n c o c " x g " w n c , o " d c n c p v . , n c t ,

Uk o Ā n c u { q p " v g o g n " c p n c o f c " g n g " c n , p c p " u l h a l e g e t i r i r . [g p k " h k m k t " i g n k v k t k r " { g p k " r t q l g n w { i w n c p c d k n k t n k k p k " v g u v " g v o g m v g . " { c v , t , c ¾ p g o n k " x g " g v m k p " m a t j o t k m p c " t g v o d e m i v p w c ± n t a c t o g e p , k r d c p m a e ; a x g n " g n g p e n g e . " u k u v g u Ā n t g t ± k n g t k p k n a , " { g p k

d k n i k u c { c t " u k d a f g o i " , r p g h n y n u o p m Rofæch 2012: 46t " Kokkinou ve Cranage, 2013: 437).

2.3. U k o Ñ n c u { q p l w g h k c k k j " "

V c t k j k " i Ñ p Ñ o Ñ p e g p k p f l g ' 2 d { p a p c p " ¥ k p " x g " f c { c p c p " u k Ñ | Ñ { n, cnu, {oq, pl . , " p { g u k p k d o { c f c p g m c } e w , m d f , c , c o f c p animasyona kadar ± q m " j , | n , " d k t " i g { n , k n u o g t o f i Ñ u u g t p k f k k x g " r c m g v " r t q i t c o m c t p , , p , " p t i v g o r k u , k o n u c k n x c g p m u c a t { , c p ± g k v n g p w h k q t o k p a , q m , f w m ± c g " n j k , n l f n g , , " A e b e r s o l d , 2 0 1 6 : 4) . *

U k o Ñ m , c l 9 5 0 v e 1 9 6 2 o { n , , n n c t , p f " q u g p m l i k t e d i Ñ p Ñ m a y e u { c v , t , o , " k t g m v g c n t v o k t , g p p f " c p " ± q m " r c j c m o , , " . B u g t ¾ | g k t m E o r t r a n g i t i p r o g r a m l a m a d i l l e t k " k n g h n d Ñ o Ñ k o Ñ g c u { q p " o q f g i g n k c v d k t o u g r a n m k k m g n t w f e g p , i t o w r m w c t t o , w ' r . I n g e n t k f , v k t k m m o d e l l e r , u q p t c d i Ñ p Ñ m " k d k m e r k e z l e r i n d e ± c n n o y , Q v " , { t , 0 n n c t f c " o c m k p g n g t k p " m q w n f n v e m a m o r o g " m l e Ñ p k Ñ o n k k f l i g i n g y a r l a r , b u o c m k p g n g t f g p " ± q m " U c { i , p . " 4 2 4 2 " x g

S i m Ñ l a s y o n , 3 ; 8 2 o n , " 3 f , 9 m k o ' c f k a d a m p i d e t m e c i l i k a l a n , n d a d a g e l i m g ¾ s t e r m e y e f g x c o " c g u v , o n k " i . g n k k o k . " 3 ; 9 2 o n k " { , n n j , | , " { Ñ m u g m " d k n i k u c { c t n c t , p " o c n k { g v k " q n f c t v , o q n c { , u , { n c " u k o Ñ n c u { q p " ± d q c m " n h c r p b o m n l i 2 v o , c n c { , n r S i m a n g i b i s i m Ñ l a s y o n d i l l e r i n i n g e l i t i r i l m e s i i l e v e 3 ; ; l a 2 d o A r e n a , W i t n e s s v e S i m f a c t o r y g i b i s i s t e m l e r i n i l e t m e l e r d e s Ñ r e ± y e n i l e m e (B u s i n e s s P r o c e s s R e - E n g i n e e r i n g) h a r e k e t l e r i i l e b i r l e m e s i s o n u c u h i z m e t s e k t ö r ü n d e s i m Ñ l a s y o n k u l l a n , m o r a n , a r t m , t . r . G Ñ n Ñ m Ñ z d e s i m Ñ l a s y o n a , s i m g e t a b a n l , m o d e l l e m e v e a n i m a s y o n l u g r a f i k i m k a n l a r , d a h i l o l m u t u r (T a k u s v e P r o f o z i c h , 1 9 9 7 : 5 4 1 ; G r e a s l e y , 2 0 1 7 : 1 0 - 1 1) .

C { p , " | c o c p f c " u k o Ñ n c u { q p . " Ñ p k x g t u k v g n g t f g x g " k n g v o g " f g t u n g t k p k p " u v c o p " f l e k t o v Ñ n c c u c { p q " p d w k p t " c n c p , p f c m k " j , | n , " k n g t n g { k k . " Ñ p k x g t u k v g n g | q t n c o , v , t 0 " I g n k g p " v c n g r n g " d g t c d g t " d w " d a c t v o , v , t 0 5) . * U c { i , p . " 4 2 4 2 <

U k o Ñ n c i u Ñ { p q Ñ p o . Ñ | f g " j g o " x k ± d k p t n " c o p ' c u n k k u | v " g o t n g e v c u c c t , c o " c u s i s t e m l e r i m a k a l i z e d i l m e s i n d e d k t " v c u c t , q h f w m e c " { c { d k p k n o w f n g n c p , n o c m v c f , t " * U c { i , p . " 4 2 4 2 < " 7 +

2.40 " U k o Ñ n c u { q p " V Ñ t n g t k

Bir model, bir sistemin veya u Ñ t g e k p " v g o u k n k f k t 0 " U k o v c u c t , o n c t , p , p " c p c n k | k . " o g x e w v " u k u v g o n g t f g k k m n k m n g t " (k p k p ± f Ñ 2018: 24). k t ç u t ç ± v , t "

U k o Ñ n c u { q p w p ; u ± k c o n Ñ n c o u c { " q p w p n k j c p i k " v Ñ t f g U k o Ñ n c u { q p g v Ñ (n g t k p k p n c o c n c t , . " c n v " d c n , n

2.4.1. Monte Carlo U k o Ñ n c u { q p w

Monte Carlo u k o Ñ n c u { q p w p " k u v c v k u v k m u g n { c r c t c m " o c v g o c v k m u g n " r t q d M a t e m a t i k s e l t p r o b l e m l e r i m n c , ± ¾ | g t m g p " t c u v i g n g " f g p k n m g p g k k p g (M e k a n e l g k p " g x g " C, 2010: 15; Sarkar, 2015: 12).

Monte Carlo s k o Ñ n c u { q p w c e c m, " d f g n n k k " n d g k p t n " g k t u v c v k u u y a c a k d k ± k Ñ f g v k n g d k n k t 0 " D w p w p " k ± k p " q n c u , n m w n n c p y D k n i Q ü c { c t " v c t c h , 0 - p] f v g p n " (d i n g o r m g o l a n a k " d k t Ñ t g v k n g p " t, q u v i u g m g 'm ü f ç , n a t , o " h q p m u k { q p n c t , herhangk " d k t " f c , n , a (B o z k a f a , 200 Ñ : 42; V a l l e Ñ e n N o r v e l k , 2013: 35).

- ◁ O q p v g " E c t n q " u k o Ñ n c u { q p w p " t c o c n c t , "
- ◁ n m " c c o c f c m k " j g t " f g k m g p " k ± k p " q n c d w n w p o c u ,
- ◁ J g t " f g k m g p " k ± k p " t c u v i g n g " u c { , " c t c n
- ◁ T c u v i g n g " u c { , n c t , p " Ñ t g v k n o g u k . "
- ◁ U k o Ñ n c u { q p w p " v c r o g m h c p n k (Ñ p l ' c i u g q p w p { c r , n o c u ,

2.4.2. U Ñ t g m n k " U k u v g o " " U k o Ñ n c u { q p w

U Ñ t g m n k ü k u o k Ñ u n v c g b i r " s i s t e m i n m o d e l l e n m e s i i l e i l g i l i d u r u m f g k m g p n g t k p k p f " g x c o f o g p , k " k o " k ± k p f g t " q m f w w " D k t " d c m c " k h c f g " k n g " f f g c x x c f o g n p , k k o t i ¾ ü u e g t g p ç k n i k n g p o g m v s i s t e m k u o Ñ Ñ t g e p m p k f g " u k u v g o k p " h c t c t c u , p f c m k " g v m k n g y e l k e n k l e m i g d t k n t g v " c m h m o d e l l e k i n f k x f k F Ñ p { c " p Ñ h w u w p f c m k " j , c b u n g t i p g m h k k k " ¾ p e r i l e b i r ç q n , c t t (I Ñ 2011: 21).

2.4.3. Kesikli Sistem U k o Ã n c u { q p w

Sistemin durumu, belli bir zaman c t c n , , p f c " u c f g e g " d k t " o Ã { c " f c " u k u v g o f g p " ± , m v , , " c p f c " stepde zaman u c { , f k ± k p f g " o g { f c p c, " o i g g g p g f g n k { K o w p g u t w t w p w " q t v c m g u k m n k " p q m v c n c t f ceşiklô g k ü v p o " ü l g a t Ã k c { k { " d e p , v m p o " (Swisher ve Jacobson, 2002: 42: Taha, 2011: 715).

Kesikli u k u v g o " u k d o k Ã n c u m { " q { p c w t f , o e , " w p u w , t n c " k o c p v , m u c n " d k u t k " o ¾ Ã n i c Ã v { m g p p ' o g ' p k ' n d g ' h i k u c { c t " r t q i j c v c u , | n c v , t , n o c u , p c " x g " i g n g e g m v g ¾ | " " f g k m q p w u w " d w ± w p kesikli sistem u k o Ã n c u b u d u m a k p a f v e s o n r a k i q n c { n n t p p c p o c u , " { c m n c D g m p g o ' m o d e l l e r i n k e s i k l i ' n o c m u k u v g o " u k ¾ Ã p q n n { t q c p n w " p i c ¾ u v 2011: 21) n g d k n k t " * I Ã n . "

2.4.6 " " M e t o c y ö n U k o Ã n c

D k t " u k u v g o f g . " d a u | Ã t " g f m w t k w d " g f g k k k t m g g p p n " g t k k " k u g " m g u k m n k " q n c t k a m m ä (t l g t k g k) s i s t e m q n a c ö t d e c m i " u c k f u n v e g p o f "

M e t o c " u k o Ã n c u { q p f c . " o q f kesikli. " " c u k Ã t " g d m c n k , " o m g u k m n k " u , ± t c o c u n Ã c t t g , m p n " k f l e d " l g d w k n { w g p d f k w n k w " 0 , \ c o c m g u k m n k " x g { c " u Ã t g m n k n g o p n ¾ p g n k k k i g ' M l a n u g k ' I x g d ' k u q n c t c m " f g k o g " i ¾ u v g t g p g f g n k h g m g p f i g t l) . e C e f i ,

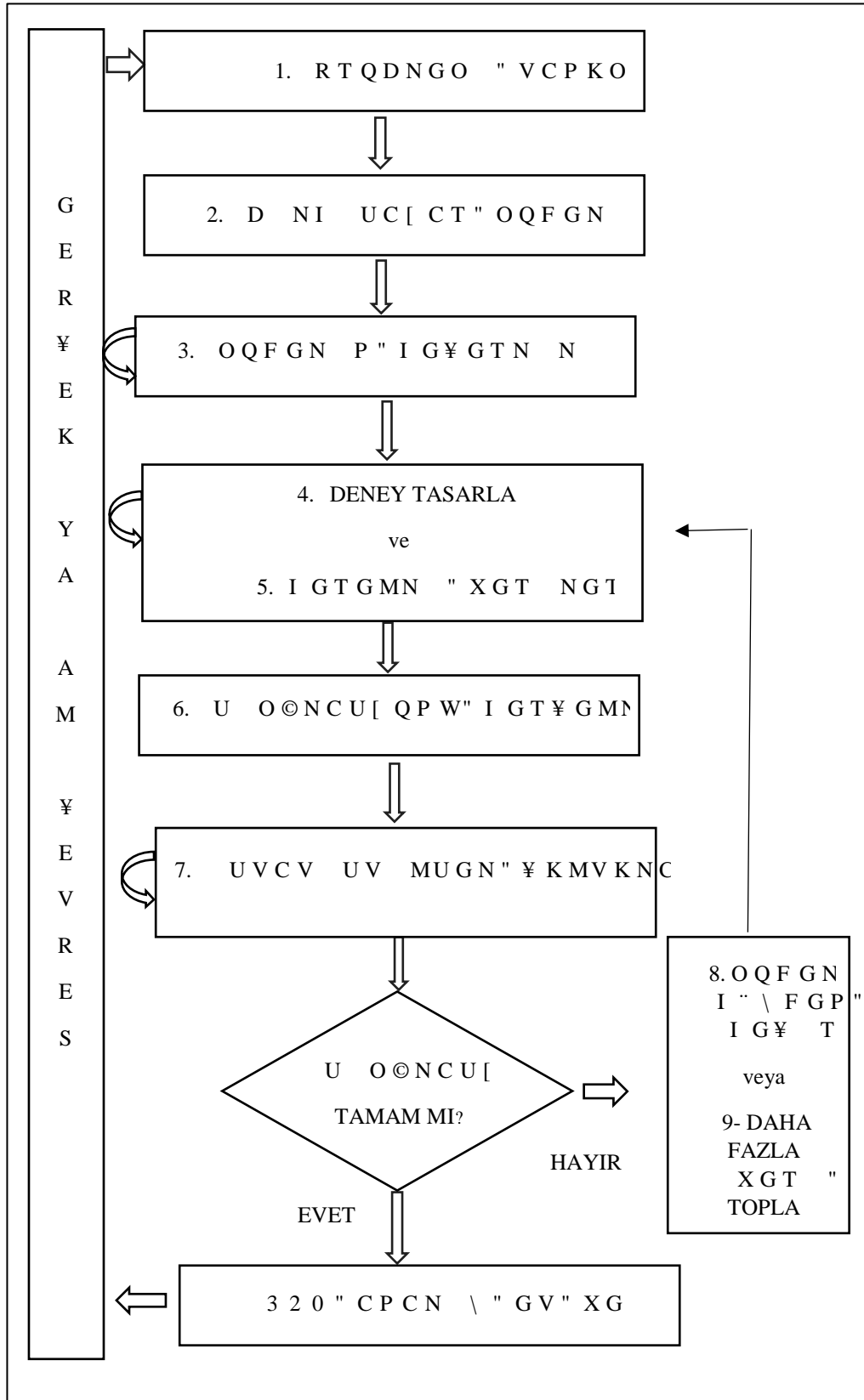
2.5. U k o Ã n c u { q p " U Ã t g e k

U k o Ã n c u { q p " ± c n , o c u , p , p " d c u k v " u B u { , n c d d c m , o o f q c f p g n n g o g p k p " { Ã t Ã v Ã n i l g i l d k v p o g u k e t x , g p " " u f k u c p n c , n o c u , p , " u c n c { c d e f n o g m t k ± k i g t d k l f ¾ q p n h " t p g k p . " o q f g n n g o g " ± c n , o c u , " f g x c o " g f g t n q n o c u , . " r t q d n g o k p " ± ¾ | Ã o g a r " f o r m a s y o n u n u , g e r e k t i n e b i l i r u , p f c (Law, 2019: 44). D w t c f c " o q f g n " m e e f c m k : " d k g t t g n m { f p d k t k o n g t f g p " q n w c p " x g p d k e k o h k g n t g " c f t , e g ' x k p n g k c m k k n g { g p " d k t " u k u v g o k p " d g n n k " l) d k t " c p n c v , o , f ,

U k o Ã n c u { q p ; b Ã n i u g n m " g b g u g e g f g " k u v c v k u v k m o Ã j g p f k u n k m " { g v g p g k " i g t g m v k t k t 0 " U k o Ã n c u q n f w k n { ± k c " c p c n k | " g v o g n k . " u k u v g o k d t { e m p p f p p " g

me t o c , -umq' p p v g f e g i k l e b k r i k t a n s i t e m i i y i k a t e g o r i z e e d e b i l m e l i d i r (B a n k s , 1998: 45).

D k t " u k o Ñ n c u { q p " ± c n , o c u , . " d k t v c 2 m e o " h c t
d k t " u k o Ñ n c u { q p " ± c n , o c u , p g t k k m B i k u n k o p Ñ n c m { q p
u Ñ t ; g e t k q d n g o k p " v m o p e l i n o m w t p w n c a u c , u , " " x g " i g ± g t n k n
f g p g { n g t k p , x g t k n g n k p q p q r n c , p d c u ' , u k o Ñ n c u { q p w
ve sonu± n c a n a l i z p i l e b e l g e l e m e c c o c n c t , p f c p " q n w o c m v c f , t
c ± , o m m u c , . " c n v " d c n , m n c t f c " x g t k n o k v k t 0



g n k n k o Ñ n U Ñ t g p k p f g a C k " v C " C n o , c n " c F t k { c i t c o ,
Kaynak: V c m e , 2003: 490 . "

2.5.1. R t q d n g o k p " V c p , o n c p o c u ,

U k o Ñ n c u { q p " o q f g n k " r n c p n c p o c u , " { c r , n o c p o c , c ± , m " x g " p g v " d k t " g m k n , f p o b l e m i n d e i f a d e e d i l m e s i c n , f , gereklidir. U k o Ñ n c u n { q p o " p c n c t m g p " c t c v , t o c p , p " g u k r i t e r l e r i , o w v n c m c " d g n k t n g p o g n k f k t 0 " U k u v g o k p " c o q n w v w t c p " d k n g g p n g t . " r c t c o v e k t i t e r l e r g ± , " m f g " k v c p , o n c p o c p , { f , n 0 , p n n c t " v c p , o n c p c d k n o g u k " k d k ± k o f g " v c p , o , p , p " { c r , n e s p i t e d i l d i k t e n s o h r a 4 b i l g i s a y a m k f k t 0 { c t f , o , " k n g " u k o Ñ n c u { q p " { c r o c p , s e v i y e s i g i b k { g v k u k o Ñ n c u { q p c " f g m c t o ğ t g , f p k α " g w m l g " o g f g d (B r a t l e y e g m " h 2011: 8).

2.5.2. Verilerin Elde Edilmesi

X g t k " v q r n c o l u r u m d a k i v e r i l e r i n e l d e d e d i l i p k n w h n c p , n f , , . " x g " k n g p f k k " d k t " u , Ñ t . g " e n k c " e t k i n b i f t a k a t k 0 t " f X 4 p Ñ k n v g Ñ t " d ¾ { n x g g e t g k n g t k " g n n g " k n g o g " k n g o k " x g " u q p " ± , c c o c n c t , = " u , p , h n c p f , t o c . " u , t c n c o o l a r a k d k t n g c f n c p f , t , n , t 0 k " D h w g " p l g p l g g n ö n k g t t . Ñ " n g ñ n Ñ p q n " c t c m " d k u l l a n a r a k y a d a m w n n c p o c m u , | , (N a y l o r t v e F i n g e r , 1 9 6 7 : 2 8 - 2 9 ; R o s s e n t i k t v d . , 1 9 9 9 : 1 5 3 7).

C p n c o n , " d k t " u g x k { g { g " k p f k t i g p g p " x g t k n m a t e m a t i k s e l b i r m o d e l k u t o c { c " w { i w p " q n w r " q n o c f , , " f c " x g t k n g t . " u k o Ñ n c u { q p w " { c r s e l n o o q c f n g v n c k " p d n c k p { k u l g k o m ¬ p " u c (S a r g e n o , 2 0 1 0 : 8 0) . , t "

V e r i t o p l a m a , c { p , " | c o c p f c " d k t " u k o Ñ n c u { q p " ± c n , i g p k " d k t " f k n k ± k p p " k " q m c r o l u k c h { f c k e d c k p , a g p g t m g p , t " (1 9 8 9 : 9 2).

2.5.3. O q f g n k p " M w t w n o c u , "

A t c v , t o c t " o l u r u m d a k i p r o b l e m l e r t e s p i t e d i l i r , b u p r o b l e m l e r i n g i d e r i l m e s i n e { ¾ p g n ¾ k Ñ n i n g t ± g m n g u c k t n k n { a g u k m p " k x g " k p e g n g p g p " b i r m o d e l h q t o Ñ i r . g { k f k k t " u k o Ñ n c u p q p " o g f i g n t k ¾ f g k h m t e m s i l e d i l e b i l m e s i , a n l a , n c d k n k t " x n g q " n w ñ n q n p o , k o n , k i p e r i p n " f w w

2.5.4. Modelin Test Edileti Ğ m " F q t w n c p o c u ,

U k o Ğ n c u { q p " o q f g n k p k p " f q t w " d k t p Ğ m k c m v c t , x n g o " c i f g , t ± , Ğ m " e u Ğ ü k Ğ k k v Ğ Ğ ü k Ğ t f g q v v t k w n k c " p { o c p n k , (Law, 2019: 41). U k o Ğ n c u { q p " o q f g n k . j " g o f q g f h g n g k t " k m w f t q c p t " v ± c n , , { q t u c " o q f g n " Ğ q f Ğ n w k p o f , q " t w Ğ o Ğ o n v k t . C ± c n , v , t , n o c u , " x g " k n i Ğ d " c c f n o d k n k p : (27). * E 3/4 w p D w p w p n c " d k t n k m v g . " f q t w n c o c " u Ğ t 3/4 e o k Ğ p k " p d " k m w ± 3/4 p g t k " x * g [t , k n n f g , d 4 9) : n " k 4 t 2 3 2 <

- < C t c v , t o c " Ğ m k k k n p q f Ğ n o c Ğ t p , Ğ p n " c p n c v , n o c u , .
- < Q n c { n c t " o g { f c p c " i g n f k k p f g " u k u v g o f g " q modeli her bir olay tipindeki faaliyetler k ± k p " k | n g { g p " d k t " c m , "
- < I k t f k n g t k p Ğ n i k n g f t g w " Ğ d k k n i k e m i Ğ e d Ğ q f Ğ m Ğ t ± k m v , n dikkatli d k t " d k 3/4 k Ğ Ğ Ğ e k t b k Ğ i s a y a r d a n g n f g " g f k n g p " v g o u k u v c v k u v k m u g n " v g u v n g t n g " v c o c o g p " f q t w n
- < Bili k u c { c t " q t v c o , p c " c m v c t , n c p " u k g o Ğ n k c n k { " q o p sonunda ± , m v , u , p , " c n , t m g p . " d w p n c t , p " r c t c o g o k p " q n o c m " x g " o v q f o g " n f f g g " k m w Ğ n p o k p o t " n g d p t " v c p vermektir.

2.5.5. O q f g n k p " Ğ c n , v , t , n o c u ,

G n g " c n , p c p " d k t " i u g k t o ± Ğ n n " u d { k q t p " " r ± t c q n d , n g o o c g u " , m c d x g " m w n n c p , n c u d k n i k d o (K l i n i Ğ e f , 1 9 5 4 | 1 3 Ğ) o D w " c c o c { c " m geldikten sonra u k o Ğ n c u q f Ğ p k p k p " r g t h q t o o p u . , p ' f j u c 3/4 n " k o Ğ Ğ konu su model, r t q d n g o k p " ± 3/4 | Ğ o Ğ " k ± k p " ; m " w m u q o p c m c o k modelden elde edilen u q p w ± i s t a t i s t i k s e p o l a r a k i Ğ x g p k t g n ' k i n g k ± n g t n k n k r analizi { c r , n n Ğ Ğ t n f , : 5 0) . " 4 2 3 2

2.5.6. U q p w ± Analizi, Raporlama

O q f g n f g " m w n n c p , n c p " u k o Ğ n c u { q p " r t q i t c o g n f g " g f k n g p " x g t k n g t " k ± k p " u q p w ± n c t , p " f g d c x w D w n v c t O c l o c Ğ e d i Ğ e n u v e r i l e r t o p l a n , t " x g " k n g p k t . " v g j g u c r n c p , t " x g " u Ğ k p o w Ğ m g c " t Ğ f { k q n t g w p o " n x p t , k o g t k p " c verilerinin analizi birbirine q n f w n g ± p c | g t " d k t " { c r , d f k t " " 3/4 p o n o u , k p c

h c t m n dan mevcut olarak no g m v g f k t 0 " Dikkatli Anıca istatistiksel verilerde c p
v g m p k m n g t n g " c p c n k |, $\frac{1}{4}$ p f g " m n $\frac{3}{4}$ p o g o " n k " c d, k r t , " o |, q t f r v
" t p g m n g o g " f i g n r g n k , k f p e " q t n v d i v e " d v k p n u o v g t u v k p p " k k p { " k { " q c n p
c ± , m ± c " d g n k t v t e d i r . o A n c a k k u p k f o g A n " d e n e y l e r i n d e i s e r a s t g e l e l i k
m c x t , i c g o p g n f g " u v q m c u v k m " u A t g ± n g t n g " k n i k n k " q
c n i q t k v o c n c t f c p ; c h ± c , t m l ' n f , g " q k n n e f t k e t n 0 " " k D v k p w i p k " n { g c t p ,
 $\frac{3}{4}$ t p g m n g o g ; p f " c i g p g o n p m n g " u v c q k e n d k o n o p f g u r k p g g t " n
u k o A n c i f i q q p w p " i g t g k " f g p g g f g g f k p k ö k n n m f o q | q . n
2010: 50).

U A t g ± " u p p w ± r o p c n k | k " { c r , n f , r o j e v a a l i p e t l e m i q p t c n
raporlap , t . " v o A p f " g r g " v c { n c t , " k n g " f $\frac{3}{4}$ m A o c p * v U $\frac{3}{4}$ " v e n f g k n g t
Mq 2014: 117).

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U OLASYON UYGULAMASI: D T " D C P M C " W D G U " " T

Optimizasyon, g n f g m k " m c { p c m n c t , " g p " k { k " x g " g m q p en iyi u q p w e c " w n c o c m . " d g n k t n k " c o c ± n c t , " i g t ± g q n c t c m " v c p (Raon1983:2). Binjvk|fo,gtv " d k t k o k " qonÃcopm"Ãdpc p m q n f w w " m c f veteri'cc|||" dkg ni nÃgeoÃg " u Ã t g u k " k n g " j k | o g k { k n g v k birq g 'v ik o k t | g v k q . p " ± c n , o c u , f , t

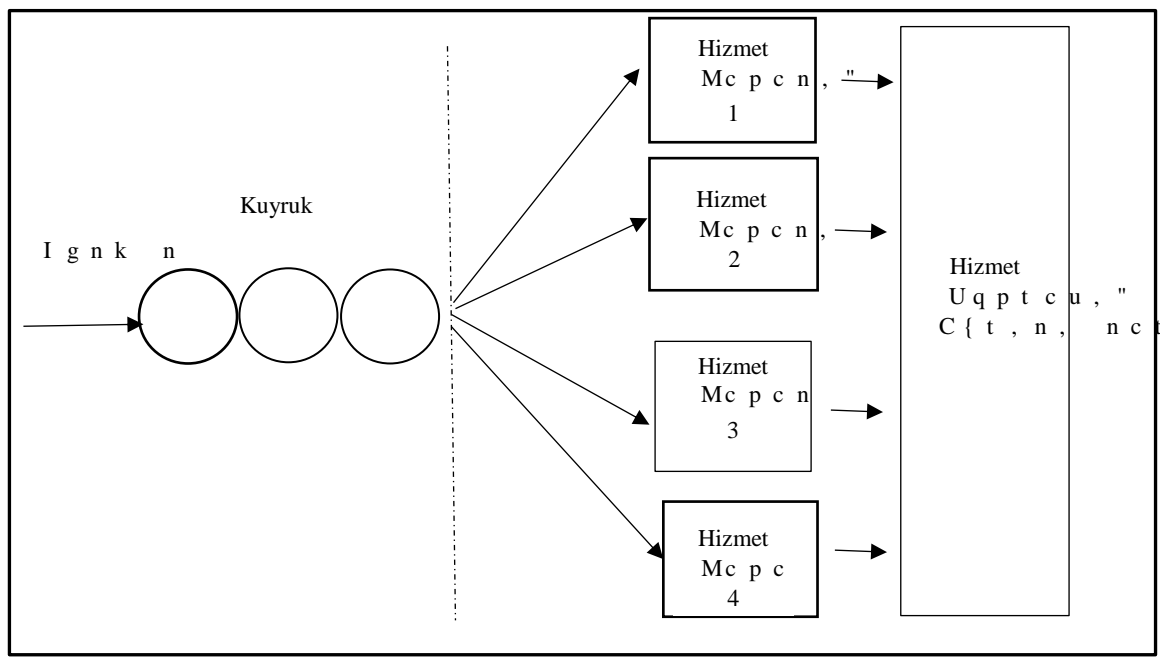
D w " v g | " ± c Fng, p ko|cnuk, øffgc" h c d a p n g v "aivd4g v v g p t g k p "" verilerinin girdi olarak kullc p , n f , , "è 'ù k c b r n o d e l ' i q g p n k v b k r t k n g t d g m n g o g " j c c p v m c , "" q v b c g p u " g p g g u Ã t g n g . t D k w "" k ± c k n g o v k f u k u v g o k p " o g x e w v " f w t w o w " k ± k p " d k t " u k o Ã n c u { m c f g o g n k " q n c t c m " u k o Ã n c { q p " o q f g n n g t k " i g c o c ± n c p D o w , " c v o , c t ± c e l k l e k g x e 3 4 w v " f w t w o g w n i " { m t p k u v , g v t c " p * d Ã { Ã m n Ã Ã h i z m e t k u y r u k d i s p l i n i n i k b i r o q f g n " o q w n w A t w f w , t p f c p " d g m t k v g t " * ± c n , o c " d Ã { Ã m n Ã Ã . " u c f c m c h i z m e t { c . " k u y r u k d i s p l i n i v e b e l l i b i r k u y r u k u , p , t , p c " w n c , n f , , p f c " f 3 4 t h c t s e n a r y o k ± k p " o q f g n n g t " q n w , A r a n t a 1 4 . 0 0 p a k e t i v t w q i 0 t " d D o w , " m w n n c p , n c t c t i m P g ± 3 4 | q Ã o o n c g p p u o " k 3 4 n ± Ã u Ã " q n c t c m " o Ã v u Ã t g k m g g t " k j k | o g v k " " m e c r { u p c c o m n p c f t c , n p f ' k m w m a n v e p d ' , A o n ' v , q g t c k p " o g o p w p k { g v k p t k , " p x , g "" c k t m , g t v c o e g e t k i m i " m o d e l t e s p i t (g i f w k p n " o x k g " v g k p C { t , e c " E Q X K F " 3 ; " r c p f g o k " f 3 4 p i l e v e k i b i k m p d e l g l e v m k u k ± c n , o c { c " f c j k n " g f k n o k v k t 0

3.1. D c p m c " w d g u k " x g " D g m n g o g " J c v v , " U k u v g o

U g ± k n g p h i z m e t s i s t e m i , k 2 p 7 "" c f g b a h k o y a s a h i p , b i r s i s t e m o l u p o Ã v g t k n g t g " d c p m c e , n w d n g ' 3 j ' g k o | Ã f g Ã n i Ã . " v i g k t k o n g k m v g t f y e t k i l i s i , 4 m Ã v i g k k r u k k n u g t o p r a s y o n ' y g 3 v ' m k n k u k . " 4 " 4 b a n g o t c u { q c u k u l v c g p o , k | n k m " r g t u q p g n k " x g " 3 1 8 i r Ã x g u p u p k e m "" n i g 4 { c r o c n B a n k o f a r d a t s u l a n h i z m e t l e r ; p c t c " { c v , t o c . " r c t c " ± g m o o n l i n e t a j u k n c v . " x g t i k " v c j u k n c v , . , k p e g t p g v x k t p m d c p m m e t v " u c v , . " f 3 4 x k | " c n , 1 i u k d k " ± d i n ' g u c t , " f m e r u c o c m v c f , t 0 " D i z m e t m c Ã t g l v d g g k g t k p f Ã m k Ã t g 3 4 g g " c n o c m v c f u c 0 ç j " w d g 2 2 ø f c " j k | ø 3 g 5 v 0 g 5 " 2 d c c t n c c u o , c " m 3 4 c

yapmakta ve 3 9 0 2 2 0 f c " j k | o g v " c n o c m " k ± k p e " g i h i z m e t m e p c n " { d ã v m v " g f t k u l k z n e n c k n p , k p g " w d g f g " k n g o n g t " i g t ± g m n g v k t k n k t m g p " d a n l a m d a w d d g k . t " d g m n g o g " j u d g m n g o g ü y g o l i z m e t t a l e b i ' u D g o k k ± k p " i g n g m ã " o v ã g t v k g n t g k n k g p t " . d k t k m k o k " u q h i z m e t e v " q n w c n , p c p " d k t " o ã v g t k { y g n i ' j v k | i o v g n v c v o p h i z m e t i g v e ã c o c " r k , n n f g , o h i z m e t m e p c d h w r w p o ' e m v n c , f c o r t c , 0 n c p " j , k e k k o y u k l u ' j d e k t t " k d k k k " c h i z m e t i s u n a n r c t c n g n " j k | o g v " b i r g d m c m p l g | o s i s t e m j i d r p e g " , u g j m k m ' 13 e u k u v g o " { c r , u , " i ¾ u v g t k n o g m v g f k t 0

wd g f g " k n g o n g t " i g t ± g m n g v k t k n k t m g p " d anlamda w d d g k . t " d g m n g o g " j u d g m n g o g ü y g o l i z m e t t a l e b i ' u D g o k k ± k p " i g n g m ã " o v ã g t v k g n t g k n k g p t " . d k t k m k o k " u q h i z m e t e v " q n w c n , p c p " d k t " o ã v g t k { y g n i ' j v k | i o v g n v c v o p h i z m e t i g v e ã c o c " r k , n n f g , o h i z m e t m e p c d h w r w p o ' e m v n c , f c o r t c , 0 n c p " j , k e k k o y u k l u ' j d e k t t " k d k k k " c h i z m e t i s u n a n r c t c n g n " j k | o g v " b i r g d m c m p l g | o s i s t e m j i d r p e g " , u g j m k m ' 13 e u k u v g o " { c r , u , " i ¾ u v g t k n o g m v g f k t 0



g n k D ' p m c " w d g u l k p u k v p g " o O g x e r w u , w d g { g " j k | o g v " c n o c h i z m e t ã | n g e t p g e " m i n g e n t g p p " f e ã " v i g u q p t c " u k u v g o f g p " c { t , n o c m v c f , k t 0 g v d g " o g k u v e g c ± , m v , u , " q n c t c m " m e d w n " g f t k m a r g e t i ¾ p g d k g b f e p " c J k | o g v " c n o d g n " ã q g ã g f g " d g m n g { g p " o ã v g t k i k t o g u k p g " i g t g m " d , t c m , n o c f c p " { ¾ p g v k n o g u k k n g o n g t k p k p " d k t " f ã | g u p , " t k ± " e p e f k g n i ' w { h c b r k , p n y o g o u c , m ' v

J k | o g v " c n o d g n " ã q g ã g f g " d g m n g { g p " o ã v g t k i k t o g u k p g " i g t g m " d , t c m , n o c f c p " { ¾ p g v k n o g u k k n g o n g t k p k p " d k t " f ã | g u p , " t k ± " e p e f k g n i ' w { h c b r k , p n y o g o u c , m ' v

Bu sistem, ekil 14te i ¾t Ñ n f Ñ 2:30-13:30k d i n i 'haricinde 08:00-19:00 c t c n , , " k ± k p " v c p , o n c p o c m v c f , t 0

g n k u , " t c " ¥ c t , " U k u v g o k " V c p , o n c o c " G m t c p ,

U k u v g o k p Ñ c v g t e k { g " g p " w { i w p " u , t c " p w o c t c u
m e t o c c " { c t c v o c f c p " j k | B i l e t m ä k i n e s i (k i b s k) Ñ g u k p f g p
g m l e t e i ¾ t Ñ n f Ñ T . C Ñ k i m l i k n w k o c t v e n g i , k i m l i k n w o c t c m Ñ " v x g g t k "
n w o c t c u , " k n g " r q t v h ¾ { g " c v c p o , " o Ñ v g t k n g t "
õ O Ñ v g t k l M k o n k m " p w o c t c u , " i k t k k " { c r o c f c p "
p w o c t c u , " c n , p e d k n k t 0 " C { t , e c " d c p m e x { c c p " v m e c l { , p v
m w n n c p e d k n o g m " k ± k p " d e p m e p , p " m e t v n e t , p , " o c
i k t k k " { c r o c f c p " f c " u , t c " p w o c t c u , " c n e d k n o g



g n15 Bilét Makinesi (Kk q u m+ " I ¾t Ñ p Ñ o Ñ

O Ñ weg x ð t u c " ¾ p e g n k m " d k n i k u k p g " d e m , n e t c
 belirlenip d k n g v " x g t k n k t 0 , " n ÷ , c p "" u p y g t t c t " a d j b i l e t k o g " v k " p "
 d g m n g o g { g " d , u , n c b a n k o " p @ Ñ u e g n t q p n e t f c " x l o w m , w p c p , " f
 takip eder. Kun n e p , e , n e t " k n g o n g t k p k " v c o c o g m k n m ±
 16 ð a d w " f w t w o " i ¾ Ñ Ñ n y o g g t n k v c g ' f p k w o c " t c b a n k o y a n g i d e r e k c t , n
 k n g o n g t k p k " i g t ± g m n g v k h a l i n d e 0 , ¥ c f t c p n d g p ð Ñ d v
 ± c t , n , t 0



g n16 n W d U g ¥ c Sistemİ [c r , u ,

3.2. R t q d n g o k p " V c p , o n c p o c u , "

J k | o g v " u g m v ¾ t Ñ " k bu lupaf d' p¾mpcg"o n vudcgdInigã "pk {pgktpl
i g ± v k m ± g " c t v o c u , p c " t c o g p " j , k k æ g' v { , i c ã p o c ã h ã |
{ c c o , o , | , p " d k t " r B u d u r u m , d ç ß j n c h k ã g v ñ g g h n g t k p k f
maksimize edecek optimal r g t u q p g n " v c j u k u k " x g " c { p , " | c o c
g v m k p " m w n n c p , n c t c m " { ¾ p g v k n o g u k " k j v k { c e , p ,

Bw "c n , da. o" c j k | l e m s i o l a k b i r d c p m c " k w k p e u g k n k m n g " o g
f w t w o w " { c p u , v c p " u c f g e g " ± c n , o c " d ã { ã m n ã
d g m n g o g " j c v v , " o q f g n k l ' g n k t w n g p v g p v ' h o w ç d h g m o f g'
r g t u q p g n " m h ç p m m n k n i e p e i n g n d e d u " j k n " g f k n f j k c v k v " , d g
modelleri q n w r a k w i k i w a l t e r n a t i f u g p c t { q k ' n i o g c k k v k t " u q p " q
i ã p ã o ã | ã p " g p " d ã { ã m " r c p d ç o k ö k f " ¾ p o x k f " k ß ; g v m
c o c e , { n c " d q w i " w w t o w d o f w g k n e " k p c ç n j , k n o " c g { f c k " n f o k v k t 0 "

Mevcutta uygulanan R q t v h ¾ K i t l e (M R / + H a v u z (H) o l m a k ã | g l t v e 2 .

¾ p e g n k m " k n g " j c x w | " o ã v g t k h i z n e t k k y f u k d i s i p l i n i c i m " u , p
{ c p , = " u U , c t f c , m " * U +) , [l c ' U n c f " , i n g (f) F y e c n k , (C) t * p v c n ,) o c { c p
q n o c m h ã t g n g " ¾ i p t e w m i k a m t n , g p k " f k m m c v g " c n , p c t c m " .
analiz edilmesi a o c ± n c w p o w p : k " i * K W * " l c " { M ç , ü o ğ , ç " | s e n a r y o l a r a p c p
g m n g p g l t g g ' n d " g m w g o e k l i s i k ã t e g u l g p o k n k k ' t d c " p m c " w d g "
m w { t w m " d g m n g o g " u ã t g n g t k " x g " j k | o g v " u w p c p " r
m e r c u k v g " f ã | g { k p d k n l g o n k g m " g o l g e k l e n t e ç p w l g o e k q n c p
c n , p o t 0

D w t c f c " u k u v g o k p " o q k o n u a d i n g e s i , d k g m ç m k æ ã a n v ' c
w n c o c { , " j g f B u h l a n ; g m g f n p g f n k t t 0 , p " h c { f c n , " m w
j g u c r n c p o c u , . " o ã v g t k n g t k p " u k u v g o f g " m e n o
k { k n g v o k ã k v n g o t g k u " k o g ' o p w p k { t v p p p " x o l a r a k i f a d e r g o v c o u g ,
edilebilir.

3.3. Verilerin V q r n c p o c u , "

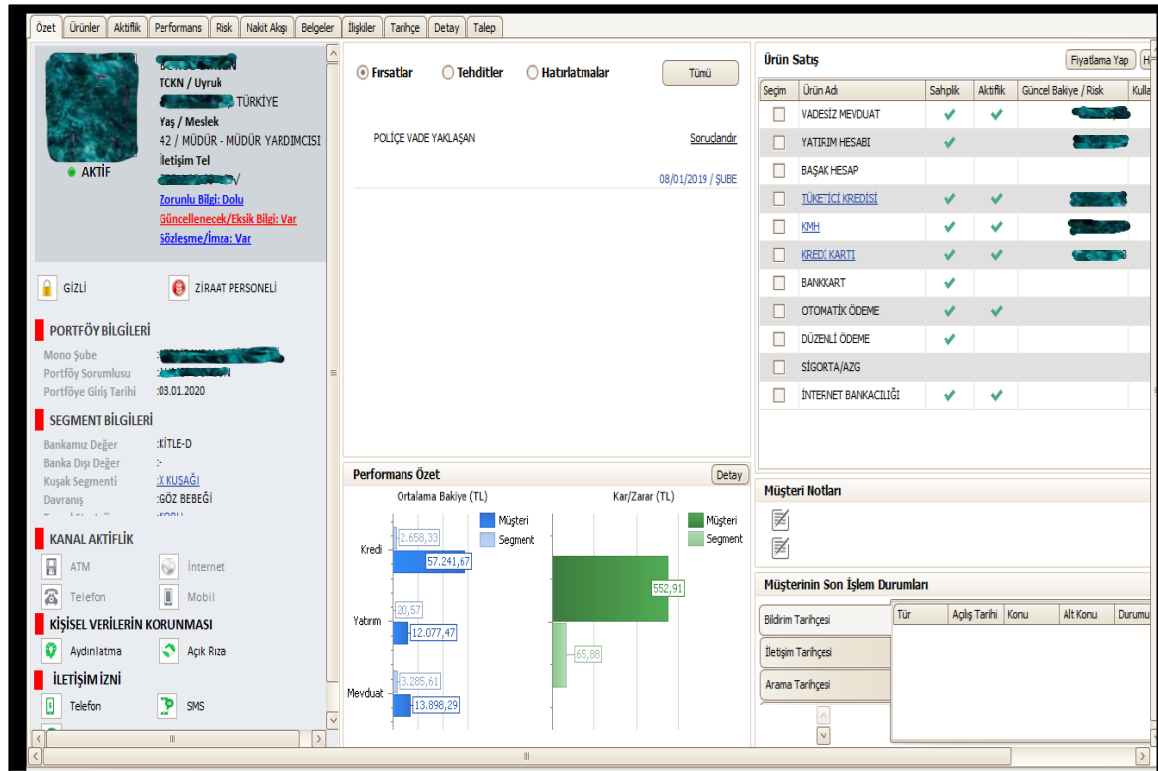
D w " v g | f g . " ± c n , o c p , p " c o c e , p c n ' d o q u s u w p " q n
olayla ilgili soru sormadan, o ã f c j c n g f g " v e r i t o p l a m a y a d a y a n c p p " i ¾ | n g o
{ ¾ p v g o l g ' h n g " d k t " c o c e c " { ¾ p g n k m " q n c t c m = " m c

f g t g g p f k t o g k a p k a y a m f g q o m a g o t c k p p " k k " p e i g m w g n o n g c " p (R 3 4 p o v , g o v x f 0 2017: 19).

D g m n g o g p j r k v k " { c r , n , t m g p " k m k v B i f i n c i s i n i t , " u A o A e r i l e r i n i g n k ". | c f o k c e p h i z m e t l i h k a m a m l a n m a u A t g u D u g f i a k t v e " * C h e t o u a n e , 2 0 0 7 : 3 1 4). B u p w p " 3 k p t e k g p d " k m m g " 4 w d l g 2 u " k p , k p , " " x g t k " r a s t g e l e 1 0 k " i u A p A n o k v k k 0 h { D o r " v i , A p o n a d n t " e f g e l e n g 4 t 6 5 0 " o A v g t k { g " c k v g o k m m A d o v p " o f k q m v A k o t g o p e k l i c i n c l e m e r { c r , m g i l i t v e r i l e r t o p l e p o , U 3 4 | , t o n q p w u w " o A p v g m t w k n " n x p t , k n e g l k n k a n k a d a p g e r e k l i i z i n l e r c n , p . o , g m l o , t o A v g t k x ' g " g j n k k | o n g g v t " k u " A k n g " k n i k n k " x g t k n g t k p " 1 8 0 d a o A f v g t , K " g d n k a e t i p f k , n i g 4 t t ' k A g m t c p " i 3 4 t A p o d a A k u u A g . "" o A g m v k g n t k n g t k p " m w n i k r a n p f , , i 3 4 t A p i 3 4 A u A A " o g m v g f k t 0

Sıra No	Bilet Önceliği	Servis	Gişe	Verilme Zamanı	Çağırılma Zamanı	Tamamlanma Zamanı
300	İkinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 2	09:07:01	09:07:05	09:07:38
603	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	09:16:37	09:16:38	09:25:14
606	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	09:39:07	09:40:00	09:43:46
610	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	10:02:09	10:02:09	10:04:53
622	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	11:11:49	11:11:53	11:13:43
625	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	11:25:53	11:25:59	11:26:13
628	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	11:28:48	11:31:09	00:00:00
309	İkinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 2	11:29:11	11:29:26	11:32:33
631	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	11:31:31	11:37:39	11:40:09
640	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	12:27:04	12:27:07	12:29:18
658	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	13:35:55	13:42:37	13:47:51
321	İkinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 4	14:40:34	14:41:03	14:42:45
686	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	14:59:57	15:00:09	15:02:05
23	Birinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 2	15:08:17	15:08:19	15:18:14
692	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	15:19:29	15:19:33	15:23:09
693	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	15:20:29	15:20:32	15:22:56
695	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	15:22:50	15:22:51	15:28:17
24	Birinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 2	15:43:50	15:43:59	15:51:28
711	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	16:11:52	16:11:56	16:13:09
715	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	16:33:59	16:33:59	16:36:59
717	Havuz	GİŞE İŞLEMLERİ	GİŞE 4	16:39:37	16:39:39	16:40:46
608	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	09:48:48	09:48:50	10:05:27
617	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	10:30:43	10:30:48	10:33:43
3	Birinci Öncelik	GİŞE İŞLEMLERİ	GİŞE 2	10:32:39	10:33:12	10:37:09
619	Havuz	GİŞE İŞLEMLERİ	GİŞE 2	10:43:45	10:43:47	10:48:25

g n k o A v g t k x g g h k | a g k n k g u " A t n g i n k g n t k k " " X g t k n g t k p " C n



g n k @ ã v bğilekinln [g t " C n f , , " G m t c p " I ¾ t ã p v ã u ã

Aktiflik Durumu	Ürün Grubu	Ürün Adı	Ürün Adedi	Ortalama Tahsil...	Aktiflik İçin Sağlanmas Ger...	Aktiflik Öngörülere	Aktiflik Kriteri
Aktif	VADESİZ GRUBU		1				
İnaktif	VADELİ GRUBU			12.105			
Aktif	YATIRIM GRUBU		1				
Aktif	KREDİ GRUBU		1				
Aktif	AVANS GRUBU		1				
Aktif	KART GRUBU		1				
Aktif	ÖDEME GRUBU		1				
Aktif	SİGORTA GRUBU		2				Son 3 ay içerisinde aktiflik kriterini sağlayan BES ve Sigorta ürünlerinden en az birer adet p...
Aktif	KANAL GRUBU		2				
Aktif	DİJİTAL YOĞUN						
İnaktif	BÜYÜKLÜK (Bİ...						
Aktif	KARLILIK (BİR...		345				

g n k @ ã v g t k n g t k p " M V g n t n " c G n f f , , , " C G n ã t p c n p g " t I k ¾ t " ã p v

n id k p k m c " , v i f g g u p k " p ± f q g m " m q p w f c " j k u b e y e l i z m e t x g t k m
c n o c m " ã | g t g " i g n g p " o ã v g t k n g t v k " p " g i n g k t n ± f g g m f n k g t v

< R c t c " [c v , t o c

< R c t c " ¥ g m o g

- < Mwt wo " V c j u k n c v n c t , " 1 " Q p n k p g " V c j u k n c v
- < Havale / Virman
- < EFT
- < F ¾ x k | " J cSwift-WestargUnikon) *
- < K p v g t p g v " D c p m c e , nI, k tYkhilene-De k p m m k ç t l Ñ p è D a n
- < F ¾ x k | " C h G h g m v k H 'k t k " 1 " r v c n
- < J g u c r "/ Kapama "
- < X c f g u k | " C n v , p " O g x f -W c w ; J g u c m 'g G n g n k " x

3.4. " p e g n k m n k r i t e l i t

O g x e w v " f w t w o ¾ p c e . g " n k w l u y k l i g j " k | k a g v n k p k " w { i w
O Ñ v g t k m n g t a " " m t g f k " x g l i k k a t e c { n p , c p n c ¾ p c ã n g " Ñ k O m Ñ k Ñ " 4 0 '
v e j c x w | " o Ñ v g t k u k " q n o c m " Ñ | g g ' g ç ñ , " p a c a n c f ' , u t ,
mevcut durumda; u , t c " d g m n g o g " u Ñ t g n g t k p k p " k u v g p k n g
memnuniyetinin v c o " q n c t c m " u c n c p c o c f , , " i ¾ t Ñ n o g m v

Lk v g t c v Ñ t " k ¾ p g g n k t y f n k d i s i p l i n i g m w n n c p { c n r c , t r c c n p ' "
± c n , q a n f c w t m ± p " c | W u ¾ c t { Ñ , n f o C ã w d r e y Ñ f l . w c ' t c h 4 , 2 p f : c ' p l " , n , p
{ c { , p ã A p p l i c a t i o n Q u e u e i n g T h e o r y f o r t h e O p t i m i z a t i o n o f a B a n k i n g M o d e l ö isimli
makalede, FIFO x g " N K H Q " f k u k r g n p k " p n k , p u k c p " " k { c n p g , o " " u ¾ p t e c g " n k r
¾ p e g n k m n k " , Ñ k g " g g ö h ¾ p e g n k m n k " q n o c o n k t i r Ñ F I F O t g " h c
f k u k r n k p k " w { i w n c p o c u , " j c n k p x f g g " k g p f " k m Ñ m u ç ' g ' r k " u
¾ p e g n b k l e m e k j c v m o d e l i n i n w { i w n c p o c u , " j c n k p f g " g p
memnuniyetine c { p , " | c o c p f c " g p " m , w u c " f d k g a n c a k b a n k a " u Ñ t g
k - t , g p " ± q m ' { ¾ p v g n o k k t p n " l e m ¾ a c e l i k l i m o d e l i n w { i w n c e p a f y o , " "
q n f w w " d g [n q k t w p k " n x o g k " m v c k n t c O d " c n , m " i Ñ p n g t f g " m , u c
k - t n , " k n g o " ¾ p e g n k m n k " m w { t w m " f k B u k n a k a l e d e p k p k p '
edinilen bilgiler, d w " v g | " ± a r c , p m c e k e u n n g p d i n i ç ' u Ñ t g r e g t g k ' p c k n p ' p f o g
m q p w u w p f c " m e v m , " u c n c o , v , t 0

Yap, n r k p v g t c v Ñ t " v c t c o c u , " x g " w | o c p " i ¾ t Ñ n
f w { f w w ; " m t k v g t n g t

- < M Ñ v i g ± d k n , o c " Ñ Ñ { Ñ m n Ñ
- < M Ñ v i g s a d k a t d u r u m u ,
- < M Ñ v i g y c k

- < MÃ nig ± dk n , o c , " f w t w o w
- < Bc p m c k ,mugÃm "g n g t k

q n c t c m " d g l n w k ' t m t g l p v o g k t n g t g " izler ¾4le gl "g rñ e g o g 'hipu "Ã t c g r e
 k { k n gesi we k Ã k n g t k " ongn ar t w , p r k o { c g u w , k " j . g f g h n g p o k v k t

3.4.1 OÃ v g t k p k p " ¥ c n , o c " D Ã { Ã m n Ã Ã

p e g n b g p m o f ' c " u w p w n c p " j k | o o g Ã v " v o g q f k g " n k j " v k g t o
 c p c n k | " g f k n g t g m " j , | n , " x i l e p q g t v w n k ¾ p g " v ± k ¾ o k Ã " o g n u g t u " n
 o Ã v g t k " k n k m k J n g g t t ' k r " q t Ã v h Ã ¾ (Ã h v o l g m k v p f f g ' t o g n k t n g
 c n o c m b i r e y s e g m Ã g " v i n g k k n y t k i l i s i (D k t g { u g h i m e y s e O m Ã + v i n g k k m k n g t
 a u k u * v D p t , g { u g k n ' k O m Ã G v i n g k k n y t k i l i s i * l k k ' t k k v e g k k t " k O k [o + e k
 m Ã v i n g k k n e k u n g u f v k c k p t , k O k C o l m a k " Ã | g t g " 6 " h c e m s i t c i s i , i l e r q t v
 h i z m e t v e r i l m e k t e d i r . T a b l o 2 d e d g n k t v k n g p " m w t c n n c t " f c j k
 { c r , n o c m v c f , t 0

Tablo 2. R q t v h ¾4a p n g t " M ' w C v e n n c t ,

R q t v h ¾4	Kurallar
D k t g { u g	C p n , m " d k t g { u g n " m t g f k " d c m k { g u k " x g { c 3 " c f n f g n k " q t v c n c o c u , " v q r n c o , . " 7 2 0
D k t g { u g r	C p n , m " d k t g { u g n " m t g f k b a k i y e s i , m k p { n g , u n k " " x x c g f v e c 3 " c { n , m " x c f v g u r k n 10.000 t l e x g n " c Ã c g u t , k " q n c p " o
I k t k k o e	E c p n , " m w t d w o n u w c p n c " p t " k o u Ã g k v " g q r k m g o " m c { p c m " x g " Ã g t k " q n c p " o Ã v g t k n g t
I k t k k o e	E c p n , " m w t d w o n u w c p n c " p t " k o u Ã g k v " g q r k m g o " m c { p c m " x g " Ã g t k " q n c p " o Ã v g t k n g t

U , t c " ¥ c o t p , f d g l p k g w ' g o k c p ¾ p o Ã n k g n k n g 4 0 " ¾ p e g n
 o l a r a k c { , t c p , T a b l o 3 t e k i l i g i b i d i r J g t j c p i k " d k t " r q t v h ¾4 { g " c v
 u g i o g p v n g t k o D K t d e c { m o g m X " t t e m g e m o X , c t n , m a q h o M k u v , n " g
 f w t w o w p f c " o b i e y s e k i t e o g m k o m n u k , . " f w ¾ p w e o g w i d k n n g k 4 . 0 " g n " F k
 q n o c u , " f w t w o w p f c " k u g " ¾4 p e g n k m u k | " d k n g v " Ã t g

Tablo 3. O \tilde{A} v g t k " U g i o g p v n g t k

3 0 " " p $\Theta \tilde{A}$ n k* g R n kt "v h $\frac{3}{4}$ (-P)	D k t g { u g n " O [. " I k q t k v k k d w n w p c p " o \tilde{A} v g t k n g t
4 0 " " p $\Theta \tilde{A}$ n k* g M k kv "n g -M $\tilde{O} \tilde{A}$	D k t g { u g n " O C " r q t v h $\frac{3}{4}$ { \tilde{A}
" p e g n k mu (J c "x $\tilde{O} \tilde{A}$ " v $\tilde{O} \tilde{A}$) k	D c p m c " o \tilde{A} v g t k u k " q n o c {

3.4.2 O \tilde{A} v g t k p k p " U c f c m e v " F w t w o w

I \tilde{A} p \tilde{A} o \tilde{A} | \tilde{A} p " c t v c p " t g m c d g v \pm k " f \tilde{A} p { c u , . " o \tilde{A} bir k n k , | n kt { w k p n w " x g " $\frac{3}{4}$ p g o n k " d k t " j c n g " i g v k t o k sadakati, k n g v o g n g t " k \pm k p " d c (Bowen ve Shopenhaker 1998: 322). g o n k "

J k | o g v " x g t g p " k n g m e g n p t, f i g ' c | u " ; t l k t ' d f m n g v o memnuniyetini x g " f q n c { , u , { n c " g p c ' f \tilde{A} \tilde{A} m $\frac{3}{4}$ v k p k ' i g v n k n f g p g (Pruyn ve Smidts, 1998: 321). O \tilde{A} v g t k " u c f c m e v k . " d k t " o c t m e d c n , n , m " q n c t c m " v c p , o n c p o c m v c f , t 0 " D k t " d c t g m c d g v \pm k " g v m k n g t g " p g " $\frac{3}{4}$ n \pm \tilde{A} f g " f k t g p f k k " x m e f c t " m e t c t k n f, k n t 2009: 41) $\frac{3}{4}$ m . v " g t f k

M \tilde{A} v s a d a k a t i m c x t c o , v e B a s u F i 1994), b i r m a l { c " f c " j k | o g v g " q n o c " u , m n , , . " o \tilde{A} n a l x g t j k p | k p g ' f l g ' x x g n c " ; K u f m p g v o g { ve Shah (2004) ise o \tilde{A} v g t k n a l k p " f l k t ' j ' k | o g v k . " u c v , p " c n o q t c p , u ' c { v c p k ' c q n c t ' u m h n c p , b n c o c m v c f , t a k a t i G p " i g p o \tilde{A} v g t k p k p " u g \pm d u r u m d a j c c { n p m , " " o q e n t f m v c { w , " d a u h e n z e r p " c n k j v k { c \pm n c t a b i l m e k k \pm k p ' \tilde{A} j o g t p w i k y i n e c { m p , " m o n c " c | c { , " v g g k n k o k . " c t | w u w " x g " g ' f m g l o p : d n 2 | Q u z e r e k o l u c a p , + o n c o \tilde{A} v g t k " u c f c m e v k . " o \tilde{A} v g t k p k p " c n , x g t k " { c d \tilde{A} { \tilde{A} m " \pm q w p n w w p w " d { (Gerpöt kd., 2001: 257) k p f g p " { c r o c u

U c n c o " d k t " o , \tilde{A} k v i g g k o ' g u p d k f p c ' m u c v j k k m r , "{ a j g n v e n l k k x c t n , m n c t a n e f i d i r p U c d f k t m " o \tilde{A} v g t k n , g k t g n " g v o t g p k p , "{ m r p c t v v , v e o t c g m v c c d g v v g " $\frac{3}{4}$ p g " i g \pm k n o g g u k o p g k n " g u d k f p , h n x " c t o \tilde{A} v g t k n g t k p k p (Evanschitzky vd., 2006: 1210; Donio ydf, 2006: 448).

I \tilde{A} p \tilde{A} o \tilde{A} | f g " o \tilde{A} f v g t k $\frac{3}{4}$ v i \tilde{A} t o " f c j f c g " i g o t a n k n , o e { g p k f g p " { c r , n o c m v c f , t 0 " U c f g e g " \tilde{A} t \tilde{A} p " { g n r c |

o ã v g t k n g t k c' t gvn, fmg" " r v g w i n v 3 0 t c ã p o n g p m ã v g f t k k ' 0 ' u c f c m
k-t n ,, k p m g - f t k n g o g | " d k e w i l t t a i n g O g ± o g p m w p k " t 0 ã s a d a k a t i , k n g t k
k-t n , n , , p " v g u o 3 4 | d w " c i p g { t j c ± p g u t , k v ' f o * , c t h f c f v d q 2 0 1 0 : 3 7 0 -
371).

Gerson (1997) ø ì ¾ t g " k , o n ã g v v o g g t n k g " t j k | o g v n g t k p k " 3 2 ø
m w t c n c " i ¾ t g " { g p k " d k t " , d 0 0 0 0 v s t e r l i n k i s e q ì | o c ã p o v c g r t , k p
k a y b e t m e k , 3 2 " u c p k v e d g w " u ã c t { g d t , p " v g n c h k u k " x g { c " u q t v
D w " { ã | f g p " x c t " q n i m p e h e l i d i ã (G e r s o n t 1 9 9 7 : g 2 2) . B u c d u (r u d h g f
i ã p ã o ã | f g " i p g k " i m g ± g v t c t k m y k e f ; w 0 w p " u ã t g n k " u c f ,
f c j c " c | " | c o c p , p , " c n o c m v c " x g " h k { c v " f g k
i ¾ u v g t d S e h m e t . , 2 0 0 6 : k 1 5 1) .

D ã v ã p u f u n d l a v , ' m c | c p , n o c u , " q n f w m ± c ± " q | m d ' t r o l q m p e e f c m
u c f , m " g o ã " m k v n g u k p k h " k o t c p v u , c t n , d u p d " e d c p - t n n p d t x r p l ' c m
ã | g t k p f g " q n w o a e w c " g , v p m , k v r g g t o g g " m u v c g j f k k r t , 2 0 0 7 : n 2 8 6 { w m " x g

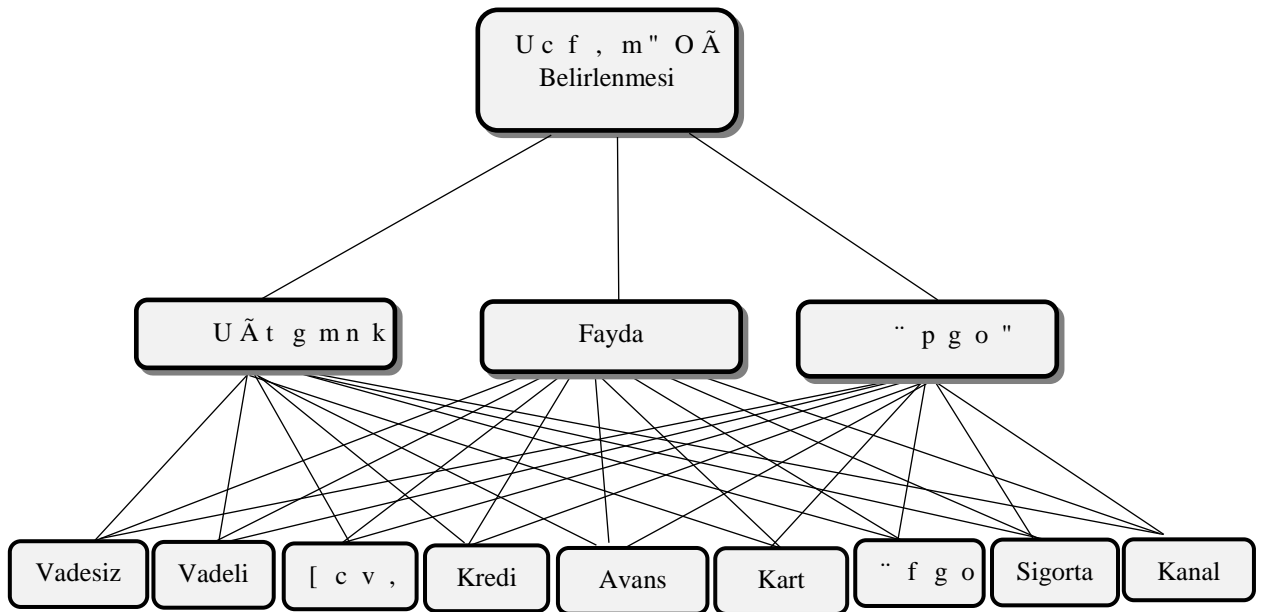
© p n ã " f g t i k " J c t x c t f " D w u k p g u u " T g x k g y ø f c
c n c p , " o ã v g t k " q f c m n , n , m " k n g " o ã v g t k " u c f
w | o c p n c S t a u f f e r f e c C a p u z z i (2 0 1 4) . " u c f , m " o ã v g t k n g t k p "
f g g t g " e k f m e k t e r i n . c Y g " p k " o ã v g t k " g f k p o g . " o ã v g t k {
m e v " f c j c " r c j c n , " x g " | q t f w t 0 " D w " p g f g p n g " ± c
¾ p g t o g m v g f k n u 0 x 0 ã m n g t k ñ g t " f c " o g o p m a l y a ' d a j n f w m
j k | o g % ' 1 5 k 2 0 - c k t p c " p f , o j f c " " h c | n c " j c i k l e r i n i , o c f l , t h ' m i o ã w n g t y
{ g p k " o ã v g t d k è l g c f p k " p o g f h g i " , ¾ q ã p ã p ã " d k t ± q m " c t
f q t w n c Y a z a m l a r a d i ¾ , t t g 0 u c f , m " o ã v g t k . " i ã x g p f k k
s a p a n m k k f k t 0

© p m p a r l a m a o t o r i t e l e r i n d e n B l a c k w e l l (2 0 0 1) , k ± k p f g " d w n w p f w w o
õ o ã v g t k o " q h ã t c m n , v c p , o n c o c m v c " x g " i ã ± " f g p i
r g t c m g p f g e k n g t f g p " o ã v g t k k p g g k o n ' c i f w t w u p ; '
(1 9 5 8) ø g " i ¾ t g " c k o c n e g e u g p k p " " { c m ã o c v n g " t f k g " n k u n v c u t p o c m "
o ã v g t k n g t k n ' o g c n r f , g f i l , g t w o v g r e g n t k p " w | w p " x c f g f g " o
o ã v m g c t { k , " r n c t , p c " p g f g p " q n o c { c e c m " v ã t f g m k "
c t v v , t , n o u c u p , " " f c g ± t , g u e , g p " f ¾ p p g " o " v c , o c m v c f , t " * ¥ q

Uc f , m " O Ã Belirlenmesi

- < Vadesiz Mevduat
- < Vadeli Mevduat
- < [c v , t , o " J g u c d , " * [c v , t , o " H q p w . " I t c o " C
- < Kredi
- < C x c p u " J g u c d , " * M O J . " J c t ± n , m " C x c p u +
- < Kart (M t g f k , B a n k a k a r t) v ,
- < " f g o g " * Q v f q g o o E g Ã k " g i p f n g k o g +
- < Sigorta (B e s . " J c { c v . " F c u T r a f i k) [c p i , p . " M e | c . "
- < Kanal * p v D c t p p g c e , n , , . " V g n g M o b i l) p " D c p m c e , n ,

Karar probleminin belirlenen kc t c t " mt k v g t n g t k " x g " c n v g t p { c r . , " u , 2014 u v g t k n f k k " i k d k f k t 0



g n d . K a r a r R t q d n g o k p k p " J k { g t c t k m " [c r , u ,

W { i w n c o c { c " k n k m k p " m e t c t " j k { g i l i c t k u k m e t , n e v , t o c " o e v t k u n g t k p k p 3 / 4 p u e n g v g k v t w g b k p l d g n k t n g p o g u k p g " x g " v w v c t u , | n , m " q t c p n c t , p q t c p n c t , p " o c p w g n " q n c q t n c f m w d n j g Ã m f n l c p { c w d k n w o ' g o u c k ± 3 / 4 | Ã o n g p o g u k " i g t g m o g m v g f k t 0 " c D w ' d k u n Ã g e g g t " k f ' ,

w { i w n c o c p , p " d w p f c ExpertChoice kl m k " q d ¼ n Ñ o ñ g t n lg " ± ¾ |
 * C { f , p 93): 4 2 2 : <

G z r g t v " E j q k e g . " ¾ p g o n k " q t i c p k | c u { q p g n "
 j g f g h n g t " x g " f g g t n g p f k t o g " c n v g t p c v k h n g t
 w { i w n c AHS f ¾ p 0 g fock { p c g p c p " G z r g t v " E j q k e g . " ¾ p e g n
 k ± k p " i g ± t g t f n k k n f o k k r k ù d k m " r d k t " { c m n c , o " u c n c o c
 x g t o g { g " f g k n " c { p , " | c o c p f c " d w " m e t c t " k ± k
 q n o c m v c f , t 0 " C { t d e e c f f w e d k n o g u k n p g p k n k n p " v c p
 x g " f k g t g t r k p " c f o g v k g o n g u k " f w t x w g o " w p p g f " c ¾ g n u k Ñ f w g k " n k p
 m q n c (analiz edilmiş bilmesine k o m v t o p p' , o c www.expertchoice.com).

W { i w n c o c p , p " d w " d ¾ n Ñ o Ñ p f g . " j k { g t c t k m " {
 m e t c t " x g t o g " i t w d w " v c t c h , p f c p " ¾ p g o " ¾ p g g t o g " e
 u m e n c u , p c " i ¾ t g " k m k n k " m e t , n c v , t o c " m e t c t "
 d g n k t n g p o k v k t n o t f i s e r Ñ j o k " m g t c t , n k m " v { d r o c f , " q n w v
 q t v c m n , , p f c " q n w v w t w n o w v w t 0

Kriterlerin ikili m e t , n c i y Tablo 4 te ki gibidir. U Ñ t u g m n k 0,637 m " m t k
 ¾ p e g n k k n h g g k g f a y d a k r i t e r i 0,258 ¾ p e g n k m " f g g t v k ¾ p k g o g " k m
 k r i t e r i 0,105 ¾ p e g n k m " f g g t k V w k v n c g t " u u , q p n , m 0 " t q D f e c p f q , t t c 2 p ,
 2 . 3 2 ø f c p " f Ñ Ñ m " q n o c u , . " o c v m e k t e d i k . p " m e d w n " g f l

Tablo 4. Kriterlerin ikili Kc t , n Matrisi , t o c "

SADAKAT	U Ñ t g m	Fayda	" p g o	" p e g n k m " F
U Ñ t g m n	1	3	5	0,637
Fayda	1/3	1	3	0,258
" p g o	1/5	1/3	1	0,105
V w v c t u , 0,04, m" q t c p , <				

Tablo 7 te u Ñ t g m n k n k m " m t k v g t k " c ± , u , p f c p e " c n v g
 ¾ p e g n k m l' ¼ g Ñ g o D w t p k f g k p e 4 0 { g Ñ " m u g m " ¾ p e g n k m 0,265 f g g t
 ile kredi, g p " f Ñ Ñ m " ¾ p e g n k mi se 0,022 ile v a l e s i z n e v d u a t y , k t m ' k Ñ k Ñ p
 m e t , n c v , t w v c ' t o u , 2 | t . n d i n d e p d k t p c ' p ,

Tablo 5. U Ā t g m n k k k k p Mt k n k g k K Mc t , n c v , t o c " O c v t k

<i>U © T G M N</i>	<i>Vadesiz</i>	<i>Vadeli</i>	<i>[c v ,</i>	<i>Kredi</i>	<i>Avans</i>	<i>Kart</i>	<i>" f g o g</i>	<i>Sigorta</i>	<i>Kanal</i>	<i>" p e g t F g g t</i>
<i>Vadesiz</i>	1	1/3	1/2	1/8	1/3	1/5	1/7	1/4	1/6	0,022
<i>Vadeli</i>	3	1	2	1/7	1/2	1/4	1/6	1/3	1/5	0,038
<i>[c v , t</i>	2	1/2	1	1/8	1/3	1/5	1/7	1/4	1/6	0,027
<i>Kredi</i>	8	6	8	1	5	3	1	4	2	0,265
<i>Avans</i>	3	2	3	1/5	1	1/2	1/4	1/2	1/3	0,059
<i>Kart</i>	5	4	5	1/3	2	1	1/3	2	1/2	0,113
<i>" f g o g</i>	7	6	7	1	4	3	1	2	1	0,211
<i>Sigorta</i>	4	3	4	1/4	2	1/2	1/3	1	1/3	0,086
<i>Kanal</i>	6	5	6	1/2	3	2	1	3	1	0,179
V w v c t u , n , m " q t c p , < " 2 . 2 4										

Tablo 6 da h c { f c " mt k v g t k " c ± , u , p f c p " c n veg t p c v
 ¾ p e g n k m ĩ ¼ g Ā g t g D w t k ĩ g ĩ p ¼ 0 { g Ā " m u g m " ¾ p e g n k O m ĩ 3 f g g t
 ile kredi. " g p " f Ā Ā m " ¾ p e g n k O m ĩ 3 f g g t ile vadeli kredilerin v t j k n k ' h Ā
 m c t , n c v , t o c " o c v t 0,03 Ā . p k p " v w v c t u , | n , m " q t c p

Tablo 6. H c { f c " Mt k v g t k " k ± k p " m k n k " Mc t , n c

<i>FAYDA</i>	<i>Vadesiz</i>	<i>Vadeli</i>	<i>[c v ,</i>	<i>Kredi</i>	<i>Avans</i>	<i>Kart</i>	<i>" f g o g</i>	<i>Sigorta</i>	<i>Kanal</i>	<i>" p e g t F g g t</i>
<i>Vadesiz</i>	1	8	7	1/2	6	4	3	5	2	0,223
<i>Vadeli</i>	1/8	1	1/2	1/9	1/3	1/5	1/6	1/4	1/7	0,018
<i>[c v , t</i>	1/7	2	1	1/8	1/2	1/4	1/5	1/3	1/6	0,024
<i>Kredi</i>	2	9	8	1	7	5	4	6	3	0,313
<i>Avans</i>	1/6	3	2	1/7	1	1/3	1/4	1/2	1/5	0,035
<i>Kart</i>	1/4	5	4	1/5	3	1	1/2	2	1/3	0,074
<i>" f g o g</i>	1/3	6	5	1/4	4	2	1	3	1/2	0,108
<i>Sigorta</i>	1/5	4	3	1/6	2	1/2	1/3	1	1/3	0,052
<i>Kanal</i>	1/2	7	6	1/3	5	1/3	2	3	1	0,151
V w v c t u , 0,03, m " q t c p , < "										

Tablo 7'ø f 3/4 p g o " mt k v g t k " c ± , u , p f c p " c n v get p c v k 3/4 p e g n k m' 3/4 g ã g o D w p k f g i p 3/4 0 {"g ã p u e g g m "k p m g" "f u g c j g 0,290" ã t ã p ile { c v , g t p , " of 3/4 p ã g n k m " f g g 0 t 0 1 9 j e g 3/4 t e m e d i r } k r ' m ã n ã p ' m c t , o c v t k u k p k p " v 0,03 ã r . u , | n , m " q t c p , " k u g "

Tablo 7. " p g o " M t k v g t k " k ± k p " m k n k " M c t , n c

" P G O	Vadesiz	Vadeli	[c v ,	Kredi	Avans	Kart	" f g o g	Sigorta	Kanal	" p e g , F g g t
Vadesiz	1	1/2	1/3	5	6	2	7	4	3	0,159
Vadeli	2	1	1/2	6	7	3	8	5	4	0,228
[c v , t	3	2	1	7	8	3	9	6	3	0,290
Kredi	1/5	1/6	1/7	1	2	1/4	3	1/2	1/3	0,035
Avans	1/6	1/7	1/8	1/2	1	1/5	2	1/3	1/4	0,025
Kart	1/2	1/3	1/3	4	5	1	6	3	2	0,113
" f g o g	1/7	1/8	1/9	1/3	1/2	1/6	1	1/4	1/5	0,019
Sigorta	1/4	1/5	1/6	2	3	1/3	4	1	1/2	0,051
Kanal	1/2	7	6	1/3	5	1/3	2	3	1	0,079
V w v c t u , n , m " q t c p , < " 2 . 2 5										

© t ã p m g k k g t n g t t " , d " c d { t p , f " c 3/4 p e j g r k " m , V f g v m g t c t t g t f l g 3/4 | g v n g D w " k f g v k g t 0 n g t " m w n n c p , i p æ t g c n r k " m j " g f u g c e r g t c n p g d p k { ã m u 3/4 g m " g f n g k p g g t " k u c j 0,253 ilã k r e d i r . © t ã p u n g j t k r " q b m f w m n c d ã v ã p 3/4 p g e g k m k " m " f f k g n m g c t v r g g 3 t 2 k 2 " , p ã d t g c w k p f n g p f , b u t , n o , puanlar , c { p , " v c d n q p w p " u q p " u ã v w p w p f c " i 3/4 u v g t k n o

Tablo 8. C n v g t p c v k h n g t k p " D Ā ve Ā p n i a g k m " " p e g n k m "

<i>Kriterler</i> © t Ā p n	<i>U Ā t g n</i> (0,637)	<i>Fayda</i> (0,258)	" p g (0,105)	<i>D Ā v Ā p n g</i> " p e g n k m	<i>Puan</i>
Vadesiz	0,022	0,223	0,159	0,082	8
Vadeli	0,038	0,018	0,228	0,053	5
[c v , t , o	0,027	0,024	0,290	0,053	5
Kredi	0,265	0,313	0,035	0,253	25
Avans	0,059	0,035	0,025	0,050	5
Kart	0,113	0,074	0,113	0,104	10
" f g o g	0,211	0,108	0,019	0,169	17
Sigorta	0,086	0,052	0,051	0,075	8
Kanal	0,179	0,151	0,079	0,165	17
Toplam	1,00	1,00	1,00	100,00	100,00

S^{3/4} | " m q u a n l a n o w Ā v g t k m g c t v k ' p f " w u t c w f o w p w f x g n " o Ā d g ğ g v q r n c o " o Ā v g t k n p g , t " " d k g + n g k t k m g k o p g f m " m k ± k q t 4 c 6 5 0 w n n c p o Ā v g t k v p k k p " q n c t c m " m w n b e l i r l e n ö k , b u , Ā t Ā t p Ā p n g t " " V c g l m b e l i r t i l e n p u a n l a r c v c p o , d k x ğ ' b Ā g t v ' g t p k a n g k n ± f k g p " " g v f i a b l o 9 0 k ö ğ v ' k t (2 c f g v " o Ā v g t k { g " c k v " 3/4 t p S d a k ā t j n g x t c c a c ' b , m ' k i ğ 4 t o Ā v g t k p k p " d j k k t / " o Ā g t v Ā p " " f u x ' v f p " c n o c " q o t a r a k p , " { c v c p , o n k c ± p f v , " ± c n 5 0 0 p Ā p g t t o p l a m p u a n a s a h i p o l a n o Ā m i n g t k ö U c f , m Ā * 1 7 g 2 6 0 k p k p t o p l a m c ' w c p , o " Ā q n i n g ö t U c f , m " Q n ö ' c { c p o Ā v g t k ħ ğ n c p , n e n t c e p t o " c x u ğ t p k g T a k l o p 9 0 k m 0 k n t c f e m k " j o Ā v g t k u k = " x c f g u k | . " x c f g n k . " { c v , 6 2 p u a n l a " m e t u c f , m " o Ā v g t k " i t m k d p w e p k f " c u " , { t g c t f " c m k o " , d k v t , k t p e k " 3/4 p v a d e s i z v e k a n a l Ā t Ā p i k u l a n a r a p 2 5 p u a n i l e u c f , m " q n o c { c p " o Ā v g t c n o , v , t 4 . 6 5 0 o Ā r n g t o k ' p k p " m w ĩ t i p g p m f v , g " , q " n Ā t w e ĩ l p n " g i t k d s c f , m " o Ā v g t k n g t k p " v q r t n c 4 0 8 " b l a Ā d g g k k n g p ö k ± g k

Tablo 9. O Ã v g tUk if g tmlc p " F w t w o w " J g u c r n c o c u , p c " n

Bilet a	Verilme -	(Bekleme o	H o	U	" V M " # @ O @ M " - k - V O - k H "							PUAN	SADAKAT	MESLEK	(' O @ s DURUMU	' s H s O - U				
						Vadesiz (8)	Vadeli (5)	' (5)	Kredi (25)	Avans (5)	Kart (10)	Odeme (17)						Sigorta (8)	Kanal (17)		
H	08:51:36	08:52:39	00:01:03	00:04:23	H	x	x	x			x	x			x	62	S	MEMUR	C	44-G	U
K	09:41:04	09:41:08	00:00:04	00:08:20	Doviz Havaleleri (Swift- Western Union)	x									x	25	p	- U - M O H \$	66-Y		K

3.4.3 O Ã v n i g t k ,

[c n , n , m . " g p i g n n g p o g u k " o Ã o m Ã p " q n o c { c p
bulunan d k t " u Ã t g ± v k t 0 " p u c u p s o n t a d a Ã p e Ã m " , w | p c Ã d h o w u , w | p x
sebebi ile { c ni , Ã p o Ã | f g " f c j c " f c * ¾ p v g o n , 2 0 1 0 : 5 9 f . p o , v , t

F Ã p { c " U t i o n g Ã " i i s e t { g " n , n , m = " õ [c c o u c n " h q
c | c n o c u , . " v Ã o " q t i c p k | o c p , p " x g t k o n k n k k p f
u c n c { c d k n o g " { g v ö g " p g k p k p " c | c n o c u , f , t

[c n { a , m o " u Ã t g u k p e g " i g n k o g " x g " ± g r i t w p ' n
c t c u , p f c m k " g s e v i m e d e n i g ¾ t k Ã o n k f p Ã " g Ã p " h Ã k u | v { " q n q l k m " x g " t
± , m o d u r u m u d u r (C u n c p " x g " J q e) c q n w . " 4 2 3 9 < " 7 5

[c n , n , m " i ¾ t g e g n k " d k g f m p x t k o . " ü Ã c g n e p o
" t i o p g Ã " { i c ¾ t n g , n , m " u , p , h n c p , f c t , a n c " u | , n p f i c c ' o m d i e p b c m
olup { c " f k n k o n g t k p g " i ¾ t g g ' r i k n f i n g f i k t m " ü [: p n d i a | c g t

- < 65-9 6 " - { I c g p ± " [c n ,
- < 75-84 { c - Orta [c n ,
- < : 7 " x g " i g v k " [c n , "

V Ã t m k { g) p v k q p r " n p w Ã o h u w e u n " " x { g c " r , u , p f c p " m j c g p p Ã | m ' h c
Ã n m g o k | f g " { c { i , p " v q r n w o u C p n e " c u m " t F w Ã p p " { f c Ã | U g c { k n p ,
v c t c h , p f c p " 4 2 2 2 " k n g " 4 2 7 2 " { , n n 2 n t c , v " , c p t c c " u ± , , p n f c c
v c j o k p " g f k n o g m v g f k t 0 " D n e k n k u f i s i n d p k 8 t 2 " " f { g c { k " Ã x n g g t " k 2
q n c e c , " f Ã (Y Ã p , 2 0 1 7 o l 2 7 6) v B g s e b e p t e . " i g n k o k " Ã n m g n g t
Ã n m g o k | f f g g " c ö g , " c ' t q v n c e p t " c f m c " n , " p Ã l j k u o " g v ¾ p g m k m
± g k v n g p g t g D ¾ c n d y e " g i , t n w o d c n " , f f c j t o " k { k " c t v n c t

v c t c h , p f c p " f g u v g m n g p o g u k . " v q r n w o " v c t c h , p
r u k m q n q l k m " q n c t c m " k { k n k m ' k j v d n l k p k ' i 4 n , h e r o g w n " g
{ c n , " d k t g { k p " j c m e n t , f p ' t O { c [c o " , n o p l u m k v e g l e v l e t p k p "
v c t c h , p f c p " u w p w n c p " u q u { c n " j k | o g v n g k k p p w { i
d w " ± c n { , c o n c , f n c c " x g ' t k 4 p e g u n k ' m f ã ã p ã n o ã v ã t 0

F ã p { c " U c n , m " " f t k i n ã n c ã v o g p " ã c p n " , v p c p t Y c o m (f ') 8 6 3 " { c
{ c , p " c n v , p f c " q n G p q ' n o c ã t c v n g " t d k p t i c g Y d k | k i ' u g g ' f ' d k ã g o p k g ' t
v q r n c o " o ã v g t k n , 3 0 ' b l a r a k g g k a k p f g o n k " q t t o ,

3.4.4. O ã v g k p k p b c " F w t w o w

¥ c n , d a , j g t j c p i k " d ± k c t n " , k o c g n t v k c p ' f q g n " c p " x g " | c o
± q w p n w m n c " k { g w d p g g p p k | o , k p ' n g n k p ã g m o l a r a k k "
u , p , h n c p f ± , c t n , , n o c , p " " o q ã n r w a r g t o k n g ã t k n g k t " k q n g c t o l a r a k ± g u k p
j g u c r n c p o , v , t

\ c o c p ; ± m e , n u , , v c , p " o ã v g t k " m k v n | g c u o k c p p g " k i c 3 4 t f g w " f v
k p v g t p g v v g p " { c r c d k n g e g g k n ' o g { k g c e m e g l i t y a ' d a n k p p " c
± c n , o c { c p ± c n ã o g } (o k ã p g v o j a r a k k u " , p , h n c p f b u t o r a m o , "
± c n , c p " o ã v g t k " q t c p , p f c p " f c j c " h ± d m , c f c p ' U
o ã v g t k " i t w d w " m e f c t " u , p , t n , " q m d c f v , k t , 0 " k ± k p

3.4.5. D c p m c e , n U , ã m ' g n g n t g k o

D c p m c " w d g u k k p n f g g e " n g c t r , c p c ' p r g t u { q o r g , n r k o p p " j k | n
v w v c t , p c " d c n , " q n c t c m " f g k k b e h l i k b i n z a n a n 4 u v g t u
d i l i m i n d e i g t ± g m n g v B a n k a k n i s t e r g i n d e n g c f n k , t p 0 c p " , t d c r p i m a e , t i f , c
k n g i n n ã t ã p x g " b u l u ã m a k t a f g m d o i ' , p g n p c r u d a b e r b i r d c p m c e , n ,
i n g i o c r p l a m a v c o c o n c p o d ' g m ã t o l u p p a b l k 1 0 d a n k u v g n g p o k
¥ c n , o c f c " q t f c m k m c " q n ã p g p k k n g ö h g t d a k i k a m e
ã | g t k p f g " q n o U | p w ' p k " k i n g n ' o c * t v c + m " " k v u c g p " , o n c p o , v , t 0 "

Tablo 10. D e p m e e n g o m Ortalama x gn Sg o g n g t k

D e p m e e , n , m " n g o k	Ortalalama U Ā t g " * f c
R c t c " [c v , t o c	2,29
R c t c " ¥ g m o g	2,59
Online Tahsilat / Kurum Tahsilat	3,29
Havale/Virman -TL	3,89
EFT	3,97
K p v g t p g v " l D D p m e n , c n I , v k " t , Y e D i l e m e x B w g i w I Ā p e g n n g o g +	4,56
F ¾ x k " I C " n G h e g v m v k " h l " k t k " l " r v c n	5,12
J g u c r " C ± o c " M e r c o c "	6,14
F ¾ x k " J c x c - W e s t e r n U n k o n) * U y k h v	6,45

¥ c n , o p f i c e d n , k m " n Ā g t o Ā p u n Ā g t g n t g d " k u p Ā t g n k " k n g verilo k M k u 0 " u Ā tyapan d Ā k v g n t o p l a m g t Ā k p v " g k t ± k k m p g f t g , p 185 " q q n c t c m " j g . u c r n c p o , v , t

3.5. O q f g n k p " M w t w n o c u , "

¥ c n , d a m o w t w n c p " u k o Ā i n g c n u k e h i m g e t o Ā s f p a r a m e t r e l e r i n e d c n U Ā t , g i n g i d n g m e " u k u v g o k p f g p " v o g Ā o k v p g " t g k f " k x n g g t k g r 14 c f g f k " ¾ t G m ' m 3 u o v i p g w t n o Y u c " n v , w t o 0 c " p , p " { c r , n f , , " d d k t k " c { p , " j k p a r a l e g h i z m e t v e r e n p h i z m e t " b i f i n l e p k k " u ¾ | " m Ā e p w u w f v m w { t w m n w " r c q t p c u n w g | n " " i n g e n p k e n " n m . c . { k a p a s i t e h i b i r m o d e l d i r . p u w | " m

I g n k e t n e g u t , " u Ā t g n g m w n i k a n p k , m d k p k " n x k g t t " k j m e ¾ t g " i g konusu verileri en iyi temsil edecek olan ve modele c m v c t , n o c m " Ā | g t g " k q n c u , n , m " f c , n , M e n c u t x g t ĩ ĩ ' g u g v k p ĩ p , " f v c , t , 0 n , o , p d g n k t n g o g m " d 4 0 0 r e c , n ĩ g n v " " r C t t d e k i p t t c " c o n , v p , " q q f Ā n Ā " q n c p w { i w n c o c u , p f c p R q f t c v h c ¾ (n . ĩ " p m h v p ĩ ĩ g o " Ā x v g " t k n g t k p k u Ā t g n g t k p k p " g p " w { i w p " Y g k d w n n " f c , n , o , p c " w { i w p " Y g k d w n n " f c , n f c o , p m e o ĩ ¾ t w Ā d i p Ā v ĩ v , k ĩ t , k o p n " c Ā t u Arena 14.00 g m t c p " i ¾ t Ā v p E k Ā a g g " t { k g . t " " G e m " o 4 c m v c f , t 0

Mwt wncp " o q f g n k p " x c t u c { , o n c t , " w p n c t f , t
 < OÃ v g t c l i k h i z m e t " m 3 / 4 { t w m " f k u k r n k p k p g " i 3 / 4 t g " j
 < U k u v g o . " j c h v c " u q p w " x g " - 3 v 4 c 0 v 5 k 2 n " " x i g Ã " p 3 / 4 g r g f " .
 13.30-3 9 0 2 2 " u c c v n g t k " c t c u , p f c " q n o c m " Ã | g t
 < M w { t w m v c m k " o Ã u Ã g g w k h v p k " p q ' n d o g c m u n , g " o { g c " " f c " d c
 f q n c { , " u k u v g o k " v g t m " g f g d k n o g m v g f k t 0
 < OÃ v g t k n g t k p " u k u d i v . g o g " i g n k n g t k . " t c u v
 < J g t " d k t k " c { p , " j k | o g v k " u w p c p " { c p k " r c
 d k t k o n g t k " u 3 / 4 | " m q p w u w f w t 0 "

O q f g n k p " m e t c t o " Ã f g g k k m g p k l g t h k n g w o { g t " w m v Ã c " g n g
 m e { p c m n c t , p " m w h g t p c p i ' k q ' t d p n c t c f n , c n C a z d a " 5 u c c v k
 bankonun j k | o g v " x g t g d k b a n k o g u r k (c) f 5 g " p Ö " Ö g t m d k . p f g

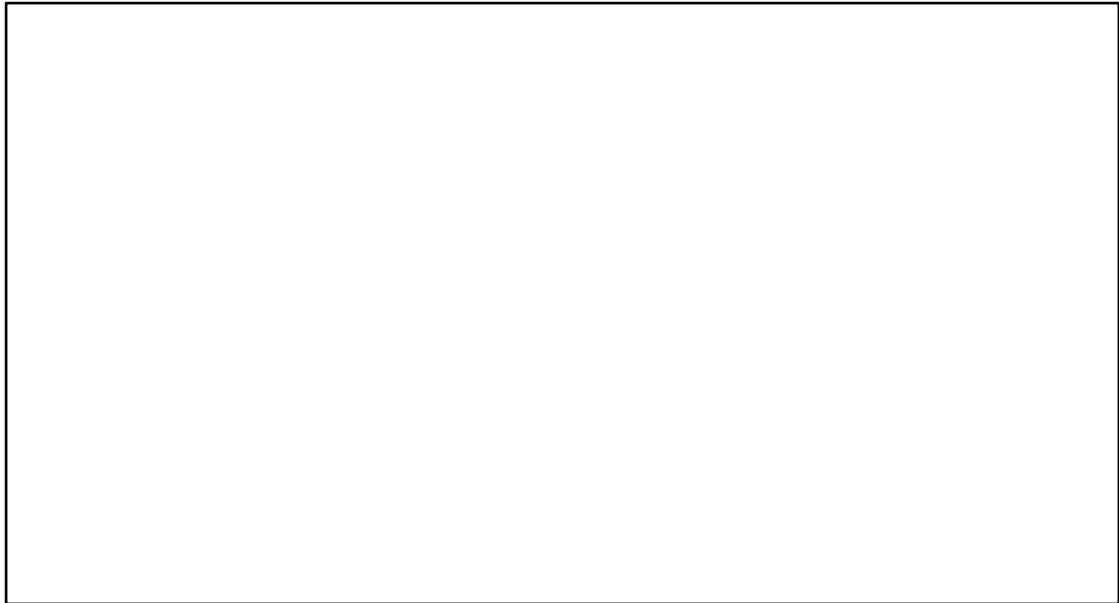
5 0 8 0 " O q f g n k p " F q t w n c p o c u ,

U k o Ã n c u { q p w p " d w " c c o c u , p f c " q n w v w t w n c
 ± c n , , r " ± c n , o c f , , . " ± c n , , { q t " k u g " p c u ,
 f g g t n g p f k t k n k t 0 w " f D , w o p n (c i " t w " c c p c o c m , " 108) : k [p c ' n ± , p .

- < Program k ± g t k u k E p j f g g e " m T W p r " o q f g n " u g m o g n g t k " k
 m q p v t q n " g f k n o k " x g " ÷ P q " g t t q t u " q t " y c t p
 u k o Ã n c u { q p " m w t w n w o w " c ± , u , p f c p " j g t j c p i k
- < R g r n k m e u { q p " m o l e d e q k w d c p f " w p p k ö c u { q p " k | n g p
 j c v c n c t " f Ã | g n v k n o k v k t 0
- < R t q i t c o " k ± g t k u k p f g " q n w v w t w n c p " i t c h k n
 { c p u , v v , m n c t , " v g u r k v " g f k n o k v k t 0 "

5 0 9 0 " O q f g n k p " ¥ c n , v , t , n o c u ,

U k o Ã n c u { q p " { c r o o d a k " Ã ± c g n , g ± k n p w t g v m p i k s y o g "
 * { k p g n g (number of replications), replikasyon w | w p n w w " * t g r e n k e c v
 i Ã p n ± m , o c " u Ã t g u k " * j c q , w t u e k i t 2 1 g d e i ' 3 / 4 t c Ã n g i v c p , c
 replikasyon u c { 20 , replikasyon w | w p n w i Ã p n ± m g " o c " u i r Ã t g u k " : " u



g n k Reñ k m c u { q p " R c t c o g v t g n g t k p k p " V c p , o n c p o

3.8. Analizler

U k o Ñ n c u { q p " o q f g n k " k n g e v c u t h i z m a t k i s t e m i , b e k l e m e c r , n o j c v v , k a g f g p k ñ D | w p g v p k - m c k g v m k o " k { k n k k " v g u v R q k u u q p " x g " j k | o g v " u Ñ t g n g t k p k p " Ñ u v g n " f c , k n k m k u k " f k m m e v g " c n , p o c f c p " H K H Q " m w { t w m " f k s o n s u z k u y r u k k a p a s i t e l i b i r (M / M / 4) : (F I F O / Ô 1 + Ô " d g m n g o g " j c v v , " o q f g I g n k " , 4 5 o c Ñ p , v " g * x k + l j i k ç v g , 2 5 o q Ñ c v p g , t " k * b U c + m c D Ñ 4 n g Ñ t o g " . " 3 0 7 0 4 ø f g " u q p u w | " m w { t w m " m e r c u k v g n k " ± q m " m h q t o Ñ n w m g t p , n c t c m " k u n k u v k ö ' j m S i s t e m m e g p b o k u w ç p 0 " ¾ V c d n q " 3 3 ø f g " i ¾ t Ñ n o g m v g f k t 0 " " "

Tablo 11. U k u v g o " R g t h q t o c p u " " | g v k

Sistemin f q n w n w (m " q t c p ,	% 45
Sistemde o Ñ v g t k " d w n w p o c o c "	% 16
Mw { t w m v c " q t v c n c o c " o Ñ v	0,1052 m k
U k u v g o f g " q t v c n (c o c " o Ñ v	1,9052 m k
Mw { t w m v c " q t v c n c o c " d g m n	0,0023 saat
Sistemde q t v c n c o c " d g m n g o g " u	0,0423 saat
Sisteme g g n g p " d k t " o Ñ v g t (k p) k	% 13

