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OPTIMAL SELECTION AND MANAGEMENT OF AN IT TEAM BASED ON MULTIFUNCTIONAL SPECIALISTS

Abstract:

Optimal Selection and Management of an IT Team Based on Multifunctional Specialists
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The development and efficiency of economic and financial institutions significantly depend on the smooth operation of IT services and IT transformation processes. The spectrum of IT directions is multifaceted, including IT infrastructure development, computer network and hardware, operating systems, security and data protection. In terms of development - system and business analysis, service planning, project management, data management, software, application development and support, quality management and testing.
Based on the above, it is important that the implementation of an IT transformation is qualified as a significant strategic project and its implementation is carried out considering the best practices and methodologies of project management. One of the most important in this process is the formation and management of a resilient IT project team.
We present logical-combinatorial and logical-probabilistic models of machine learning applied to complex reconfigurable systems. Structural reconfiguration is achieved through the multifunctionality of system elements, enabling interchangeability and replacement in cases of partial or complete failure. This increases adaptability, flexibility, reliability, and fault tolerance, which are quantitatively evaluated using logical-probabilistic methods.
The methodology is implemented in OptiCrew - a platform which helps organizations in building resilient teams. Each team member is assessed across all potential roles, and optimization algorithms identify the best team configuration and role allocation.
Scenario-based simulations—unavailability, performance dips, and scope changes—evaluate team robustness under stress. Teams with interchangeable personnel demonstrate higher reliability and reduced need for external replacements. Additionally, AI and natural language processing convert behavioral data into quantitative indicators, while Generative AI identifies skill gaps and provides targeted recommendations to improve team adaptability and performance.

Keywords:

Multifunctional Personnel, Optimization Methods, Logical-Combinatorial and Probabilistic Modeling, Flexibility, Reliability, Team Resilience
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Introduction

In the conditions of rapid development of computer and information technologies, IT transformation is a necessary and important process in the business, economic, financial and banking sectors. In the process of IT transformation, great importance is attached to the restructuring of the IT organization, including the correct selection of project teams, optimal distribution of functions, and the development of effective management directives based on adverse situations arising in the process of functioning (JAMES, M. D., SMITH, H. A., 2008); (JOHANNING, V., 2022); (SMITH, H. A.; SINGH, S., MCKEEN, J. D., 2007); (GUNAWAN, B,; HERA, N., FITRI, N., 2023). Based on our many years of research, the formation of IT project teams with multifunctional personnel is much more effective than staffing with narrowly specialized, single-function personnel (TSIRAMUA, S., 2017). As is known, the formation of IT project teams using the AGILE methodology also implies the multifunctionality of personnel. The advantage of the multifunctionality of personnel compared to single-functional specialists is especially clearly manifested in such properties of IT teams as the flexibility of the team as an organizational system (OS), reliability, resilience, etc. These criteria determine the potential capabilities of the IT team as an OS and they help us form the best team with high efficiency (TSIRAMUA, S.; SULKHANISHVILI, S.; ASABASHVILI, E.; KVIRTIA, L., BERIKASHVILI, I., 2024). But the multifunctionality of personnel is especially important in the process of team functioning, when undesirable situations arise such as a team member is completely or partially unable to perform the function (role) assigned to him. In such a case, the multifunctionality of the personnel determines the maneuverability of the team, which is expressed in the structural reconfiguration of the system (team). (HSIUNG, P.; SANTAMBROGIO, M., HUANG, C., 2018). In particular, it becomes possible to redistribute roles among other team members: complete replacement of a specialist with a fault (in the case of a complete fault) or mutual replacement (in the case of a partial fault), which ensures the resilience of the project team and successful delivery of the project (TSIRAMUA, S.; MELADZE, H., DAVITASHVILI, T., 2024).

In a real environment, the content and scale of IT tasks corresponding to the strategic goals of the organization determine the definition and distribution of roles and responsibilities in the IT team. The three main roles of the project team defined by the Agile methodology - product owner, scrum master and developers (programmer, tester, business analyst, UX/UI designer, DevOps.), in turn, combine all the specializations and interpersonal skills needed to create value - Backlog management and prioritization, requirements definition, acceptance and delivery criteria, communication with stakeholders, decision-making, negotiation, conflict management, business analysis, knowledge of management methodologies, emotional intelligence, leadership, manual and automated testing, programming languages, system architecture definition, problem solving, data analysis, etc. According to the Scrum Guide, the roles of an AGILE team, with key responsibilities, as well as the technical and interpersonal skills required to effectively perform the work, are given in Table 1. (SMITH, H. A., MCKEEN, J. D., 2015).

In the process of forming and functioning of an IT team, it is important to have information about which role each multifunctional specialist can perform based on his/her skills and with what effectiveness, that is, we should have specialist assessments for each role in a 10/100 point system or probabilistic assessments in the interval [0, 1]. These assessments can be obtained in various ways, for example, by testing specialists, expert assessment using TOPSIS, fuzzy logic methods or other methodologies. (BASHELEISHVILI, I., S. TSIRAMUA, S., 2018). However, in this paper we will not dwell on these issues and will focus on the issues of forming teams with multifunctional specialists, structural analysis, models for assessing effectiveness criteria, methods for optimizing the management of processes for proper selection, optimal distribution of roles, and reconfiguration if necessary.

Table1. IT Project team roles and skills.

Role	Hard Skills	Soft skills
Product Owner Focus: Maximizing product value	● Backlog management and prioritization ● Requirements definition ● Business analysis, ROI and value assessment	● Stakeholder communication ● Decision-making and negotiation ● Vision setting and alignment ● Team accountability
Scrum Master Focus: Enabling Agile processes and team effectiveness	● Agile frameworks (Scrum, Kanban,DSDM, XP) ● Metrics and continuous improvement practices ● Facilitation techniques	● Servant leadership ● Conflict resolution ● Coaching, empathy, and emotional intelligence ● Team accountability
Software Engineer Focus: Designing and building technical solutions	● Programming languages and frameworks ● System design and architecture ● Version control ● Secondary cross-functional skills (testing, analysis, documentation)	● Collaboration and pair programming ● Problem-solving ● Openness to feedback and learning ● Flexibility and adaptability ● Team accountability ● Willingness to help beyond formal role
QA Engineer Focus: Ensuring product quality and reliability	● Test design and execution (manual and automated) ● Test tools and frameworks ● Defect monitoring and evaluation ● Secondary cross-functional skills (testing, analysis, documentation)	● Focus on detail ● Constructive communication ● Advocacy for quality without blame ● Flexibility and adaptability ● Team accountability ● Willingness to help beyond formal role
Business Analyst Focus: Aligning business needs and technical implementation	● Requirements analysis and modeling via business process modeling language (BPM) ● Process mapping ● Data analysis and documentation ● Gap analysis ● Secondary cross-functional skills (testing, analysis, documentation)	● Active listening ● Facilitation of workshops ● Clarifying ambiguity ● Flexibility and adaptability ● Team accountability ● Willingness to help beyond formal role
UX / UI Designer Focus: User-centered design and experience	● User research and usability testing ● Wireframing and prototyping tools ● Interaction and visual design principles ● Secondary cross-functional skills (testing, analysis, documentation)	● Empathy for users ● Collaboration with developers and stakeholders ● Communication of design rationale ● Flexibility and adaptability ● Team accountability ● Willingness to help beyond formal role
DevOps / Platform Engineer Focus: Deployment, infrastructure, and system reliability	● Cloud platforms and infrastructure as code ● CI/CD pipelines ● Monitoring and security practices ● Secondary cross-functional skills (testing, analysis, documentation)	● Cross-team collaboration ● Proactive problem-solving ● Responsibility for shared system outcomes ● Flexibility and adaptability ● Team accountability ● Willingness to help beyond formal role

Source: SMITH, H. A., and MCKEEN, J. D. (2015)

1. Research Methodology

For optimally solving the problem of *Organizational Systems* (OS) — selecting and reliably operating an IT team — it is essential to have information about the functional capabilities of each specialist and the functional resources of the entire team, in other words a competency matrix. This will enable the prompt and accurate development of management directives, the timely redistribution of functions between specialists, the replacement or interchangeability of specialists, and so on (BASHELEISHVILI, I., TSIRAMUA, S., 2017).

For this purpose, using databases of professional capability assessments for various roles of multifunctional specialists (MFS), a logical (0,1) matrix of IT team functional resources is compiled: $B(n\times m)=[a_i(f_j)]$, $n\geq m$, $i\in[1,n]$, $j\in[1,m]$, where $a_i(f_j)=1$ if the i-th specialist is capable of performing function f_j, and $a_i(f_j)=0$ otherwise. A probability matrix of functional capabilities MFS $P(m\times n)=[p_i(f_j)]$ is also compiled, where $0\leq p_i(f_j)\leq 1$ is the probability of specialist a_i performing function f_j. These matrices contain the necessary information for optimally solving the problem of organizational modeling and team management based on MFS:

Specialists / Functions	a_1	a_2	...	a_n
f_1	$a_1(f_1)$	$a_2(f_1)$	...	$a_n(f_1)$
f_2	$a_1(f_2)$	$a_2(f_2)$	...	$a_n(f_2)$
...	...	...	...	...
f_m	$a_1(f_m)$	$a_2(f_m)$	...	$a_n(f_m)$

The columns of the logical (0,1) matrix $B(n\times m)=[a_i(f_j)]$ correspond to specialists a_i, and the rows to functions f_j. The sum of the ones in the rows indicates how many specialists in the team possess the ability to perform each individual function from the given set $F=\{f_j / j\in[1,m]\}$. The sum of the ones in the columns indicates the number k_i of functional capabilities of specialists a_i, $i\in[1,n]$, which are used to determine the degree of multifunctionality of the MFS. The sum of the ones in the rows and columns k_Σ indicates the total number of functional resources of the team.

To develop a model for assessing specialist reliability, we will use the property of the MFS to perform any one function from a finite given set or not to perform one, two, etc. functions from the same set. Performance is a state of the MFS in which its key performance parameters (professional level, psychological and physical condition) are within limits that correspond to a specialist's ability to perform at least one function out of their multiple functional capabilities.

If one or some of the assigned functions fail, the MFS experiences a partial failure, but may still remain operational. If all assigned functions are lost, a complete failure occurs, and the MFS becomes inoperable. This situation significantly influences the approach to MFS from a reliability perspective. The functional state of the specialist is included as an element of reliability calculation in the model, which significantly changes the method for solving the problem of calculating system reliability.

In general (regardless of time), a specialist can be in one of the possible states of the set G:

$G=\{(f_1,f_2,...,f_k), (f_1',f_2,...,f_k), ..., (f_1',f_2',...,f'_{k-1},f_k), (f_1',f_2',...,f_k')\}$,

where $(f_1,f_2,...,f_k)$ - MFS full operational state; $(f_1',f_2,...,f_k)$, ..., $(f_1',f_2',...,f'_{k-1},f_k)$ – MFS partial failure states; $(f_1',f_2',...,f_k')$ - MFS total failure state.

The state of a multifunctional specialist at a given time t is a random function of time $t>0$ and takes values from the set of all possible states G (TSIRANUA, G.S., 1970).

The reliability assessment model for an MFS must reflect all of its operational states it may find itself in during operation. Consequently, the probability that a specialist at time t will be able to perform at least one function from the set $F_a=\{f_j/j\in[1,k]\}$, i.e., will be in an operational state, will be (TSIRAMUA, S., 2017):

$$P_a(t) = 1 - \prod_{j=1}^{k}(1- p_t(f_j)), \quad (1)$$

where $P_a(t)$ — the probability of a specialist being in working condition at a given time t, $p_t(f_j)$ — The probability of executing the *j-th* function at a given time t.

The model (1) demonstrates the high reliability and extensive use of MFS in the OS. The multifunctionality of specialists allows for mutual monitoring of specialists and, upon detection of partial failures (complete loss or decreased performance of a given function due to adverse external or internal factors), targeted interchangeability or replacement is carried out to ensure continued successful operation of the system. To assess the reliability and fault tolerance of an IT team consisting of MFS, we describe its *Operability Condition* (OC): To execute a function $F=\{f_j / j\in[1,m]\}$ by a team $A=\{a_i / i\in[1,n]\}$ of classes $n\geq m\geq k_i$, $i\in[1,n]$, it is necessary that all $n^*=m$ elements from n simultaneously execute all functions f_j, $j\in[1,m]$ of set F in each operating time interval. Moreover, each MFS at any given time t can execute only one function from set F.

Since the MFS of system A are functionally interchangeable, function F can be executed in different ways. *The Shortest Path of Successful Operation* (SPSO) of a system is a conjunction of its logical elements such that no component can be removed without disrupting the system's operation (RYABININ, I.A., (2000).

The SPSO of system A of classes $n\geq m\geq k_i$, $i\in[1,n]$, can be written as follows (TSIRAMUA, S., 2017):

$$S_q=a_{i1}(f_{j1})\&a_{i2}(f_{j2})\&...\&a_{im}(f_{jm})=1, \quad (2)$$

where

$i_1=1, 2, ..., n-m+1$;

$i_2= i_1+1, i_1+2,...,n-m+2;$

.....

$i_m= i_{m-1}+1, i_{m-1}+2,...,n;$

$j_1 \neq j_2 \neq ... \neq j_m$; $j_1, j_2,...,j_m\in[1,m]$; $q\in[1,N_S]$.

N_s – the flexibility index (the number of SPSOs, i.e., the number of possible options for distributing functions between MFSs) is determined by calculating the permanent of the matrix $B(n\times m)=[a_i(f_j)]$: $NS = per[B(m\times n)]$.

From (2), it is clear that each SPSO includes elements of the matrix $B(n\times m)$ that are located at the intersection of different rows and different columns.

The OC of the system under consideration is written as the disjunction of all available SPSOs:

$$F_A[a_1(f_1) ,..., a_n(f_m)] = S_1 \vee S_2 \vee \ldots \vee S_{Ns}. \quad (3)$$

The analytical form of the OS description enables the application of *Logical-Probabilistic Methods* (LPM), described in detail in (RYABININ, I.A., 1970), which can be used to quantitatively assess the reliability and fault resilience of a system consisting of MFSs.

To characterize the reliability of an MFS, it is necessary to introduce a number of additional parameters, such as:

Degree of multifunctionality of the i-th MFS:

$$v_i=k_i/m, \quad (4)$$

where k_i is the number of functional capabilities of the MFS a_i; m is the number of functions assigned to the system.

The functional capacity of the MFS is the sum of all probabilities of performing the assigned functions - $\sum p_t(f_j)$, $j\in[1,k]$.

A probabilistic model of the failure-free operation of a system consisting of MFS can be constructed by summing all the probabilities of the system being in a working state. In a particular case, assuming the probability characteristics of all elements are equal $p_1=p_2=...=p_n=p$, the probability of failure-free operation of the system is determined using the formula (TSIRAMUA, G.S., 1970):

$$P_A(F)=\sum_{\gamma=0}^{k_\Sigma} N_L(\gamma) p^{\gamma} (1-p)^{k_\Sigma-\gamma} \quad (5)$$

where $N_L(\gamma)$ — the number of operational states of a team with γ lost functional resources; p is

the probabilistic characteristic of the operational capability of the elements.
Fault tolerance is the ability of a system to actively resist external or internal influences and perform its functions under such influences.
The fault tolerance indicator $g_A(\gamma)$, which characterizes the system's ability to function with $\gamma \in [1, k_\Sigma]$ lost functional capabilities, depends on the number of possible system states N_M and the number of operational states N_L for a given γ and is determined by the formula:

$$g_A(\gamma) = N_L/N_M. \quad (6)$$

The number of all possible states N_M for a given γ in turn depends on the values of k_Σ and γ is calculated using the well-known formula:

$$N_M(k_\Sigma, \gamma) = k_\Sigma! / \gamma!(k_\Sigma-\gamma)!, \quad (7)$$

where $k_\Sigma=nm$, when $n>m=k$ and $k_\Sigma=n^2$, when $n=m=k$.
The structure perfection index η_A characterizes the system's potential and allows for the comparison of different system structures to select optimal systems in terms of fault tolerance. It depends on all possible system states N_Ω, on the total number of operational states N_R, and is estimated using the formula:

$$\eta_A=N_R/N_\Omega, \quad (8)$$

where $N_\Omega=2^{nm}$, when $n>m=k$ and $N_\Omega=2^{n^2}$, when $n=m=k$.

The total number of operational states of N_R is estimated as $N_R=\sum_{\gamma=1}^{k_\Sigma} N_L(\gamma)$.

Therefore, to estimate η_A we obtain the formula:

$$\eta_A=\sum_{\gamma=1}^{k_\Sigma} N_L(\gamma) / 2^{k_\Sigma}. \quad (9)$$

It should be noted that the indicators of the perfection of the structure and the reliability of the system are equal under the condition $p_i=0.5$, $i \in [1,n]$ - $\eta_A=P_A(F)|_{pi=0.5}$.
For example, let's conduct a structural analysis of the system $n=m=k_i=4$.
The probability of failure-free operation according to formula (5) will be:

$$P_A(F) = 24p^4-72p^6-96p^7+234p^8+528p^9-1808p^{10}+2160p^{11}-1392p^{12}+528p^{13}-120p^{14}+16p^{15}-p^{16}.$$

The functional resource matrix of this system will be:

$$B(4\times4) = \begin{array}{c|cccc} & a_1 & a_2 & a_3 & a_4 \\ f_1 & 1 & 1 & 1 & 1 \\ f_2 & 1 & 1 & 1 & 1 \\ f_3 & 1 & 1 & 1 & 1 \\ f_4 & 1 & 1 & 1 & 1 \end{array}$$

The values of $N_L(\gamma)$ and $g_A(\gamma)$ of the $n=m=k_i=4$ system depending on γ are given in Table 2.

Table 2. $n=m=k_i=4$

γ	$N_M(n, \gamma)$	$N_L(n, \gamma)$	$g_A(\gamma)$
0	1	1	1
1	16	16	1
2	120	120	1
3	560	560	1
4	1820	1812	0.9960
5	4368	4272	0,9780
6	8008	7432	0,9280
7	11440	9312	0,8140
8	12870	8010	0,6220
9	11440	4464	0,3900

10	*8008*	*1512*	*0,1890*
11	*4368*	*288*	*0,0659*
12	*1820*	*24*	*0,0132*
13	*560*	*0*	*0*
14	*120*	*0*	*0*
15	*16*	*0*	*0*
16	*1*	*0*	*0*
Σ	N_Ω=65536	N_R=37823	η_A=0,57713

Source: The results obtained by formulas (6), (7) *and* (8)

Table 3 presents estimates of the parameters $N_S(n,m)$, $N_\Omega(n,m)$, $N_R(n,m)$ and $\eta_A(n,m)$ of the system of class $n=m=k_i$ from n=2 to n=6, from which it is clearly seen how quickly the structural parameters increase with an increase in the number of MFS.

Table 3. Structural parameters from n=2 to n=6

n	$N_S(n,m)$	$N_\Omega(n,m)$	$N_R(n,m)$	$\eta_A(n,m)$
$n=m=k_i$				
2	2	16	7	0,4375
3	6	512	247	0,4824
4	24	65536	37823	0,5774
5	120	33554432	23190311	0.6912
6	720	68719476736	54425825575	0,7923

Source: The results obtained by formulas $N_S=n!$, (6) *and* (8)

The results given in Table 3 show that for systems of class $n=m=k_i$, the flexibility index N_S increases factorially with the increase of structural parameters n, m and k. The share of performance quantities in relation to all possible quantities of the system also increases. Accordingly, the structural perfection index of the systems increases.

2. Optimal Selection of an IT Project Team Based on Multifunctional Specialists

To illustrate the process of organizational modeling (optimal selection and management) of an IT team, let's consider the formation of IT Team *A*, which is tasked with performing multiple functions (roles) $F=\{f_1, f_2, \dots, f_m\}$, $m>1$ (see Table 1).

Let the database contain performance indicators for $n^*>m$ specialists in relation to function *F*. The task is to optimally select from n^* such $n=m$ MFSs whose combined operation will ensure the performance of function *F* with maximum productivity, reliability, and flexibility. These criteria determine the IT team's ability to ensure mutual control, interchangeability, mutual assistance, and replacement of specialists, if necessary and as a result successful delivery of the project. It can be noted that this is the primary source of innovation for the proposed concept and its difference from the traditional approach to the organizational design of highly effective *Organizational Systems* (OS).

The problem is solved by processing the probabilistic matrix of specialists' functional capabilities $P(F_a)$ using optimization and logical-probabilistic methods, which ensures optimal results. This solves not only the problem of optimally selecting primary and backup specialists, but also the optimal distribution of functions among MFSs. Considering that the number of options for distributing m functions among $n^*>m$ MFSs for $Fa_i=F$, $i=1, 2, \dots, n^*$, is $n^*!/(n^*-m)!$, and the number of options for selecting $n=m$ specialists from n^* is $n^*!/m!(n^*-m)!$.

Based on the above-described UR, it follows that a necessary and sufficient condition for the functioning of system *A* is its formation from $n=m$ specialists who, together, can ensure the performance of all the functions of set *F*.

For $n=m$ and $Fa_i=F$, $i=1, 2, \dots, n$, N_S takes on a maximum value of $\text{Max}(N_S)=n!$. This means that an IT team based on MFSs has a high degree of flexibility, and as the number of MFSs and their degree of multifunctionality increases, the system's flexibility increases factorially. Using the probabilistic matrix of functional capabilities MFS $P(m\times n)=[p_i(f_j)]$, we introduce the notation

x_{ij} for each "performer-function" pair. These form matrices of functional states $X_N(m \times n)$ at various points in the system's operation. For optimal team formation, we apply a modernized optimization model:

$$\Phi = \prod_{i=1}^{n} \prod_{j=1}^{m} p_i(f_j)x \to \max$$

$$\sum_{i=1}^{n} x_{ij} = 1,\ j \in [1, m];$$

$$\sum_{j=1}^{m} x_{ij} = 1, i \in [1, n]. \quad (10)$$

For n>m, solving problem (10) selects an IT team of *m* specialists out of *n* whose combined functions ensure the performance of function *F* with maximum efficiency. For *n=m*, the above model (10) only solves the problem of optimally distributing functions among performers.
After solving the problem of optimally selecting and distributing *m* roles among MFSs, we obtain a system $n=m \geq k_i$, $i \in [1,n]$.

Let's consider an example of optimal personnel selection. Suppose we need to ensure that function $F=\{f_1,f_2,f_3,f_4,f_5\}$, is fulfilled within a given project deadline. To do this, we need to form a group of five specialists capable of performing these functions. Let's assume we are selecting from eight candidates $A=\{a_1, a_2, ..., a_8\}$, for whom the database contains probabilistic assessments of their functional capabilities relative to the specified functions (Table 4).

Table 4. n=8, m=5, $1<k_i<5$.

A/F	f_1	f_2	f_3	f_4	f_5
a_1	*0.92*	*0.98*	*0.95*	*0.00*	*0.90*
a_2	*0.94*	*0.96*	*0.00*	*0.93*	*0.93*
a_3	*0.00*	*0.90*	*0.97*	*0.94*	*0.91*
a_4	*0.96*	*0.99*	*0.98*	*0.00*	*0.92*
a_5	*0.00*	*0.98*	*0.00*	*0.96*	*0.00*
a_6	*0.95*	*0.00*	*0.90*	*0.00*	*0.94*
a_7	*0.00*	*0.93*	*0.92*	*0.00*	*0.00*
a_8	*0.97*	*0.94*	*0.00*	*0.99*	*0.96*

Source: Randomly generated data for simulation

Using the probabilistic indicators of MFS functional capabilities presented in Table 4, we will estimate their degree of multifunctionality, probability of failure-free operation, and functional capacity. The assessment results are presented in Table 5.

Table 5. Probabilistic Characteristics of MFS

MFS	*Degree of Multifunctionality MFS*	*Reliability*	*Functional Capacity of MFS* $\sum p_t(f_j)$
a_1	*0.80*	*0.99999*	*3.75*
a_2	*0.80*	*0.99999*	*3.76*
a_3	*0.80*	*0.99998*	*3.72*
a_4	*0.80*	*1.00000*	*3.85*
a_5	*0.40*	*0.99920*	*1.94*
a_6	*0.60*	*0.99970*	*2.79*
a_7	*0.40*	*0.99440*	*1.85*
a_8	*0.80*	*1.00000*	*3.86*

Source: The results obtained by formulas (1) and (4)

To optimally select and deploy specialists so that their combined performance maximizes the overall efficiency of the unified function *F*, it is necessary to solve optimization problem (10). The resulting IT team consists of five MFSs, whose functional resource matrices are summarized in Table 6.

Table 6. $n=m=5$, $1<k_i<5$

№	A/F	f_1	f_2	f_3	f_4	f_5
1	a_4	0.96	0.99	0.98	0.00	0.92
2	a_5	0.00	0.98	0.00	0.96	0.00
3	a_3	0.00	0.90	0.97	0.94	0.91
4	a_8	0.97	0.94	0.00	0.99	0.96
5	a_6	0.95	0.00	0.90	0.00	0.94

Source: Results of Table 6 obtained using the optimization model (10)

The interchangeability diagram of MFS according to formula (2) is given in Table 7.

Table 7. SPSO of system $n=m=5$, $1<k_i<5$.

№	f_1	f_2	f_3	f_4	f_5	$P(S_g)$
S_1	a_1	a_2	a_3	a_4	a_5	0.84924
S_2	a_4	a_2	a_1	a_3	a_5	0.82315
S_3	a_1	a_4	a_3	a_2	a_5	0.78990
S_4	a_4	a_1	a_3	a_2	a_5	0.84058
S_5	a_4	a_3	a_1	a_2	a_5	0.77204
……						
S_{18}	a_4	a_3	a_5	a_2	a_1	0.69393
S_{19}	a_5	a_4	a_3	a_2	a_1	0.76504

Source: The results obtained by formula (2)

Based on the above discussed methodologies OptiCrew was created - a platform which is specifically designed for tech-company CTOs. The platform helps organizations in building resilient, flexible and high-performing teams. It allows CTOs to calculate the flexibility, reliability, and agility of a team. This interchangeability model used in OptiCrew allows to simulate partial or complete MFS failures and develop optimal solutions for the interchangeability or replacement of specialists, ensuring the continued success of IT transformation project. OptiCrew already helped IT companies in reducing team selection time, increasing reliability and project delivery rate within timeline and budget.

Conclusion

Multi-functional specialist (MFS) refers to elements of an IT team capable of performing all or part of the functions assigned to the system. From a reliability viewpoint, multifunctional specialists are multi-pole elements within the IT team that can be fully operational, partially failed, or completely failed.

MFS-based systems gain flexibility, maneuverability, and fault tolerance due to their numerous functional pathways. In the event of partial failures, these systems can continue to operate effectively by reconfiguring their structure, redistributing functions, and leveraging the interchangeability of MFS.

By using quantitative (expert, probabilistic, fuzzy logic, or other) assessments of MFS capabilities for the assigned functions, the selection of specialists and the distribution of functions among them can be optimized. It is also feasible to optimally manage the replacement process in the event of a complete failure and the interchangeability process of MFS in the event of partial failure to enhance the efficiency of system operations.

Generally, the probability of successful operation of a reconfigurable system depends on the distribution scheme of functions among the MFSs, both during the design and operation phases. Using the model (10), we are able to design an optimal system, achieving efficient management of the reconfiguration process.

During the initial design stage of a reconfigurable system, the optimization model (10) can be used if reserve elements are available. This model enables the optimal selection of a certain number of MFSs and the best distribution of functions among these selected elements. When reserve elements are not available, only an optimal distribution of functions is possible through structural reconfiguration by interchangeability elements within the system.

If an MFS fails completely during the operation of a reconfigurable system, the optimization model (10) allows for the optimal replacement of the failed element with a spare element. In case of a partial failure, it enables optimal interchangeability and guarantees effective functioning of the system due to structural reconfiguration.
Similarly, the optimization model (10) can be applied to design cost-effective systems that consider material, financial, and time constraints. For instance, it can be used to allocate functions among MFSs to achieve the quickest performance of the system's assigned functions.

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