

## **H2B-MPS: WORKFLOWS INSTRUCTIONS FOR HUMAN RESOURCE MANAGEMENT TO BE ACCORDING TO MR-MPS-SW FOCUSED ON INCREASE THE SOFTWARE QUALITY**

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The problems related to not meeting deadlines and overflow costs, should not be deposited only to the techniques and technologies used, but also the absence of processes focusing on the development and qualification of its members. This paper propose a group of some workflow instructions called H2B-MPS, an extension of the process presented by Horita et al. (H2B) (2012), and developed to be aligned to the process of Human Resource Management (GRH) present in the MR-MPS-SW. For this reason, in each of H2B activities, we defined a workflow instruction that seeks not only to meet expected results, but incorporate the best practices of GRH and the MR-MPS-SW. Through the mapping between their work instructions and expected outcomes of the GRH is possible to verify that the model is in accordance with the MR-MPS-SW.

**Keywords:** Human Resource Management, MR-MPS-SW, Process Quality, Software Development, *GRH*. H2B-MPS: Workflows Instructions for Human Resources Management to be according to MR-MPS-SW focused on increase the Software Quality

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## 1. Introduction

The high dependence of human resources for develop a software project has evidenced by the importance of its management. For this reason, several studies show that this human resources are which managing and strengthen innovation, producing, make decisions, lead, motivate, communicate, supervise, manage and direct the affairs (Horita & Barros, 2012; Cibotto et al., 2011; Tohidi, 2011; Peter & Riehle, 2009; Hazzan & Hadar, 2008).

Similarly, the software quality has become a prominent factor in the current market. Therefore, many techniques, methodologies and models have been developed in order to ensure its implementation and realization. Among them, the Brazilian program called Process Improvement of Brazilian Software (In Portuguese, *Melhoria do Processo de Software Brasileiro - MPS.BR*<sup>1</sup>) is a widely spread in the Brazilian market, held by the Association for Promotion of Brazilian Software Excellence (In Portuguese, *Associação para Promoção da Excelência do Software Brasileiro - SOFTEX*) and since its launch in December 2003, evaluated over 330 organizations among its maturity levels (Softex, 2012).

Thus, considering the above, this article aims to propose a group of workflow instructions for human resources management focused on the quality of software development, named H2B-MPS. These workflows are defined in each activity presented at the process model H2B presented by Horita et al. (2012) and each of one was develop to attend the prerequisites of the process Human Resource Management (GRH) present at the Reference Model for Improving the Software Process (In Portuguese, *Modelo de Referência para Melhoria do Processo de Software - MR-MPS-SW*).

For this reason, this article is structured as follows: Section 2 presents the theoretical framework used, Section 3 presents the model H2B-MPS and flow directions of work proposed for model adequacy H2B the requirements of MR-MPS-SW. Finally, Section 4 presents the conclusions and proposals for future work.

## 2. Literature Review

### 2.1. The MR-MPS-SW and Human Resources Management (GRH)

Developed in 2003 by the SOFTEX as part of the MPS.Br program, the MR-MPS consists of a reference model with the definition of prerequisites for the improvement of the quality of the software process. In accordance with Capability Maturity Model Integration for Development (CMMI-DEV) and following the described headlines in its main program, this model was divided into seven maturity levels, each of them composed by processes which define what the expected results are, and capabilities which express its institutionalization level and implementation in the organization (Softex, 2012).

Among their maturity levels, the E, focuses primarily institutionalize a pattern of organizational processes, based on defined activities and best practices present in the organization. Due to the differences between these projects, it is hardly possible to develop a process that is as flexible as to serve them without requiring any adaptation. Based on this, it is necessary to define guidelines that will be included in the definitions of standard processes, for accommodation of the context in which it is applied.

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<sup>1</sup> All company, projects and process acronyms are based on Portuguese.

For this, this level is divided into five processes as follows: Reuse Management (GRU), Project Management (GPR), Organizational Process Definition (DFP), Evaluation and Improvement of Organizational Process (AMP) and Human Resources Management (GRH) process used in this article and consists of three areas: Planning, Recruitment and Human Resources Assessment, Training and Knowledge Management (Softex, 2012). For its evaluation is defined a set of attributes processes presented in 11 expected results shown in Table 1.

Table 1. Description of the expected result defined for the GRH process presented at MR-MPS-SW

Expected Result	Description
<b>GRH1</b>	Organization strategic needs and projects are reviewed to identify resources, knowledge and skills required and according to the need, plan how to develop them or hire them;
<b>GRH2</b>	Individuals with the skills and competencies required are identified and recruited;
<b>GRH3</b>	Training needs that are the responsibility of the organization are identified;
<b>GRH4</b>	A training strategy is defined, in order to meet the training needs of the projects and the organization;
<b>GRH5</b>	A tactical training plan is defined to be focused on implement the training strategy;
<b>GRH6</b>	The training identified as being the responsibility of the organization is conducted and reported;
<b>GRH7</b>	The effectiveness of training is evaluated;
<b>GRH8</b>	Objective criteria for evaluating the individuals and groups performance are defined and monitored to provide information of its performance;
<b>GRH9</b>	An appropriate strategy for knowledge management is planned, established and maintained to share information within the organization;
<b>GRH10</b>	A specialists network in the organization is established and a support mechanism for the information exchange between specialists and the project is implemented;
<b>GRH11</b>	Knowledge is shared and made available in the organization.

As can be seen in Table 1, the expected results defined for the GRU process focused on identifying and developing the necessary skills, training and monitoring of the performance of members and ultimately the creation of a network of knowledge and experts of the organization.

## 2.2. Human Resources Management on Software Development

Several studies demonstrate that holding the best technological tools, using the most efficient techniques and work models is not enough to guarantee the success of a software project (Tohidi, 2011; Shan et al., 2010; Hazzan & Hadar, 2008). It is necessary the

existence, in parallel, of a human resources management able to develop skills and guarantee the effective allocation of its members, in order to increase the quality of its process (Qiu, 2011).

However, several managers attribute more importance to the technical and practical areas rather than the human resources, which end up by losing the focus in software development processes (Andre et al., 2011). A manager must act in order to encourage the developing staff to work together as a team, concentrating in the customers' needs and product quality.

This context made managers responsible not only for the leadership in planning, organization and control of the efforts expended during the project. They had to develop other skills like manage people, e.g. ability to lead and stimulate people's development, abilities to solve problems and excellent interpersonal competence (Tohidi, 2011).

### 2.3. Related Work

A table comparing the processes that work to human resources management was presented by Horita et al. (2012). For its preparation, they used questions and studies in the literature that address this management projects for general projects and for those with a focus on software development.

For this article, in a complementary way, we analyzed the processes for human resources management defined by the Project Management Body of Knowledge (PMBOK) and the reference model MR-MPS-SW, quoted in Section 2.1.

The process present in PMBOK is composed by four processes and artifacts formed by the input and output policies that, according to the project's needs, can interact with each other, they are: human resources planning, hiring and mobilize the project team, the project team to develop and manage the project team. From this, Table 2 presents some works from Horita et al. (2012) and the works related to this article.

Table 2. Comparative Table.

	<b>Amâncio <i>et al.</i> (2009)</b>	<b>P-CMM<sup>1</sup> (Curtis &amp; Miller, 2009)</b>	<b>PMBOK (2008)</b>	<b>MR-MPS- SW (2012)</b>	<b>H2B (Horita et al., 2012)</b>
<b>Planning Human Resources</b>	Yes, during the initial phase of the project.	Yes, defined in the initial phase of the model.	Yes, step performed to identify and define policies for the project.	No.	Yes, it worked in the beginning of the project.
<b>Revise Organization's Needs</b>	Yes, approached during the planning.	No.	Yes, step performed based on the factors and organizational assets.	Yes, the needs are identified and reviewed to develop.	Yes, uses company factors.
<b>Opt for Internal Mobilization</b>	N/A	N/A	N/A	N/A	Yes.

	<b>Amâncio <i>et al.</i> (2009)</b>	<b>P-CMM<sup>1</sup> (Curtis &amp; Miller, 2009)</b>	<b>PMBOK (2008)</b>	<b>MR-MPS- SW (2012)</b>	<b>H2B (Horita et al., 2012)</b>
<b>to External Staffing</b>					
<b>Work the Mobilization and Staffing</b>	No, the model only defines functions and timesheets.	Yes, conducted based on project needs and availability in your organization.	Yes, uses organizational factors and organizational structure to carry out the recruitment of members.	Yes, recruited according to the skills required.	Yes, conducted based on the chart settings.
<b>Training Management</b>	High. It has a specific activity and an action and monitoring plan.	High. Worked throughout the evolution of the model.	Average. Identified, proposed and realized.	High. Identified, planned, implemented and evaluated.	High. Crafted according to project needs.
<b>Performance Management</b>	High. Definition and monitoring of indicators.	High. His analysis is performed throughout the model.	High. The effectiveness of the team is constantly assessed at project milestones.	High. Criteria established and monitored to provide improvements	High. Constant monitoring during the project.
<b>Organizational Knowledge Management</b>	No.	No.	No.	Yes, strategy established and maintained to share information.	Yes, focused on sharing the individual with the company.
<b>Uses Historical Database</b>	No.	Yes, used in several steps of the model.	No.	Yes, suggests the creation of a network of dental specialists of the organization.	Yes, used in all phases of the project.
<b>Human Aspects Management</b>	No.	Yes.	No.	No.	Yes, monitored during the project evolution.

<sup>1</sup> People Capability Maturity Model (Curtis & Miller, 2009)

As seen in Table 2, the models MR-MPS-SW and H2B are the ones that stood out in this analysis. Among them, we highlight differences in the human resources planning and review and in how knowledge and human aspects are managed and controlled. Because of this, following will be presented workflow instructions to make the model H2B aligned with the requirements of the MR-MPS-SW.

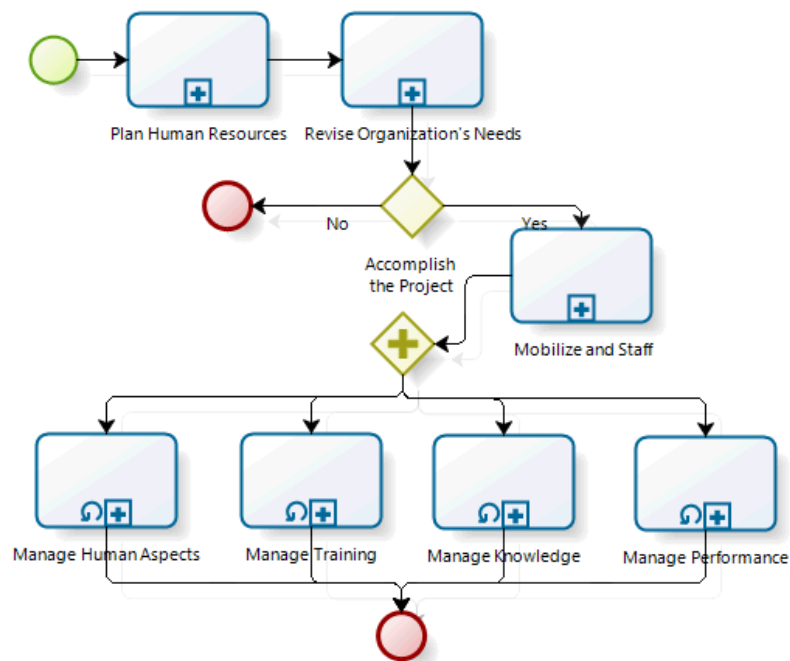
### **3. H2B-MPS: Human Resources Management according to MR-MPS-SW**

This section presents the workflow instructions proposed for fit the H2B model to the requirements of the GRU process present at the MR-MPS-SW. These instruction streams are comprised of a series of activities to be performed in sequential manner and prescriptive. To its credit rating were used elements from the Business Process Modeling Notation (BPMN) (Cruz, 2010) language standard notation to facilitate the understanding of its users.

The H2B model focuses on improving human resource management in software projects. Thus, through its appropriateness to the expected results of the MR-MPS-SW, we aim to reduce and minimize the problems caused by the instability of members in project teams and enhancing the quality of the development process. Figure 1 shows the model H2B in detail.

As shown in Figure 1, the H2B model consists of a set of seven activities; three of them being carried at the early stages of design while the last four, performed in a continuous manner during the evolution of development. Moreover, it emphasizes also the possibility of incorporating the model asynchronous and transparent of any software development process.

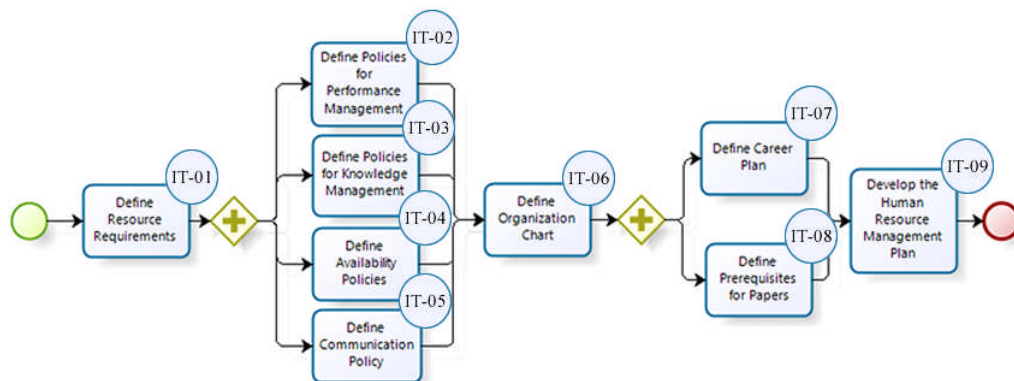
Each process present in MR-MPS-SW consists of a set of expected results and capabilities that express the degree of institutionalization and implementation of the process in the organization [3]. For the H2B model could attend the requirements of Human Resources Management (GRH) process were defined a set workflow instructions for each of their activities. Next, each of them will be presented.



**Figure 1. H2B Model (Horita et al., 2012)**

### 3.1. Human Resources Plan

Accomplishing the human resources planning, from the very beginning of the project, has a big importance for its manager (Horita et al., 2012). Moreover, this activity through the proposed workflow, seeking to serve the expected results GRH1, GRH8, GRH9 GRH10 and the MR-MPS-SW. Figure 2 shows the flow of your work instructions.



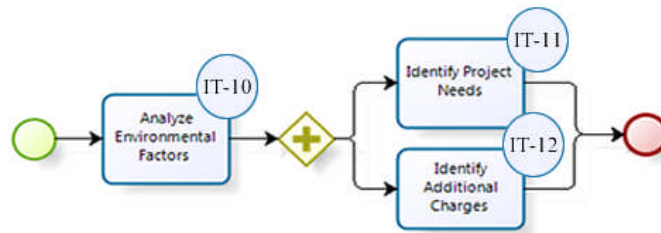
**Figure 2. Human Resources Plan Workflow Instructions**

As shown in Figure 2, the workflow begins by defining the resources needed to carry out the project. Next, a set of four management policies will be defined: Performance Management, Knowledge Management, Availability and Communication. In the next stage, the organizational structure are defined and, in parallel, your career plan and detailing the technical prerequisites for assigning each of their roles. Finally, draw up the Human Resource Management Plan (HRMP).

### 3.2. Review the Business Needs

After planning, it is essential for the projects manager to work on the formation of their team. And, for that, they must base on the analysis of the organization's environmental factors (physical and social environments and people's attitude) and the organizational processes assets (Horita et al., 2012).

However, it is noteworthy that the revision of the organization's needs must encompass not only human needs, but also those needs connected to technical and support factors, such as: expenses with support people (e.g. accountants and administrators), travels, materials and trainings. Figure 3 shows the flow of work instructions such activity.



**Figure 3. Review the Business Needs Workflow Instructions**

As seen in Figure 3, the project needs identification, as well as the additional costs should be based on the analysis of the organization environmental factors. Besides this, the additional charges and the project needs will be storage in the HRMP. So, the workflow defined for this activity seeks to adapt the model to the expected result GRH1 of the MR-MPS-SW.

### 3.3. Hire and Relocate Members

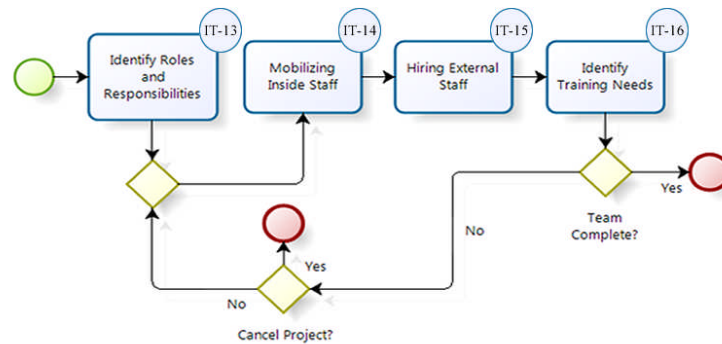
The goal of this activity consists in identifying, from an organizational chart, which roles and attributes will be needed to the execution of the project (Horita et al., 2012). The workflow instructions defined for this activity is shown in Figure 4 is proposed for analyzing the choice between internal mobilizations - considering or not the need for training - or outsourcing.

Thus, this workflow seeks to adapt the model to the expected results GRH2, GRH3, GRH4 GRH5 and the MR-MPS-SW.

As shown in Figure 4, the formation of the project team is based on roles and attributes defined in the organizational chart. Through this, your manager may choose to perform the staffing or the reallocation of internal members. Following this definition, the training needs identified must be defined and documented in the Tactical Training Plan (TTP).

Besides this, during the course of this activity, the project manager must have artifacts that show what is the levels of knowledge, skills, experience and availability of organizational members so that they serve as an aid in the definition of those who will compose the team. An important tool to facilitate this management is a historical database, fed during project execution.

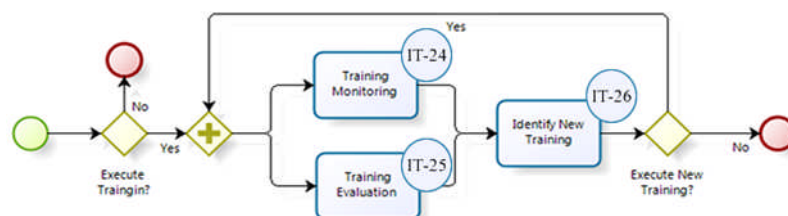




**Figure 4. Hire and Relocate Members Workflow Instructions**

### 3.4. Manage Training

When any training needs in the team members are identified, they must be carried out according to the rules and specifications defined on TTP (Horita et al., 2012). As well as monitoring their work using a technical coordinator whose focus is to identify and propose measures to improve infrastructure evolution and didactics. Figure 5 shows the workflow defined for this activity.



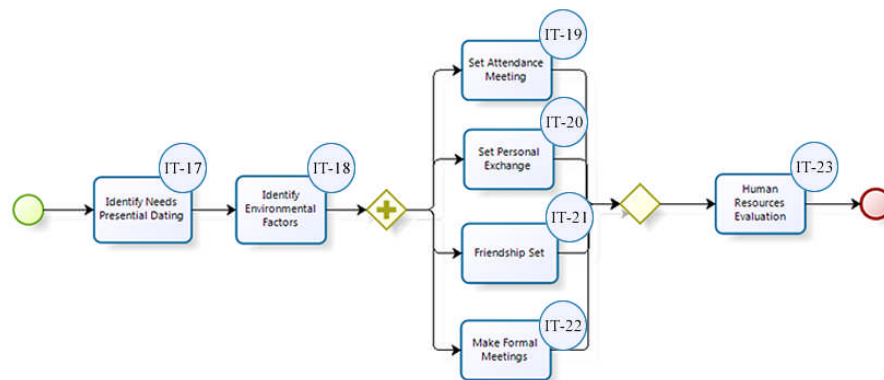
**Figure 5. Manage Training Workflow Instructions**

As shown in Figure 5, it is observed that when training needs identified, one may choose to perform them or not. Later, if implemented, they must be constantly monitored and evaluated. With this result, new training with need for achievement, assessed between all involved. This instruction stream focuses on fitness models the needs of the expected results GRH4, GRH5, GRH6 GRH7 and the MR-MPS-SW.

### 3.5. Manage Human Aspects

This activity has as purpose to identify the environmental and social factors which may influence the good development of the project (Horita et al., 2012). A monitoring to keep everyone motivated and satisfied with the activities has contributes broadly to increase the quality, effectiveness and efficiency of the final products. Figure 6 shows the workflow instructions proposed for this activity.

Moreover, constant evaluation of satisfaction and motivation of its members becomes important for both to be constantly worked and potentiated. Because it is human aspects during its realization, it is proposed the assistance of a psychologist to interpret the data and information collected.

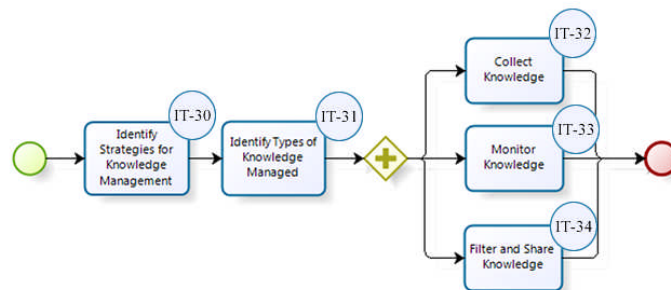


**Figure 6. Manage Human Aspects Workflow Instructions**

### 3.6. Knowledge Management

The knowledge management activity is to take techniques and tools to assist in the identification, retention and sharing of knowledge on the level of the individual to the company level, so that this serves to improve the quality and productivity of projects or future development.

This knowledge consists of a set of data generated during the project, obtained from individuals in the organization's culture, and organizational changes in the internal and external processes (Wei et al., 2010). On its storage form, we can use paper or physical storage devices. In order to attend the expected results GRH9 GRH11 the MR-MPS-SW, Figure 7 shows the workflow instructions that aims to manage it.



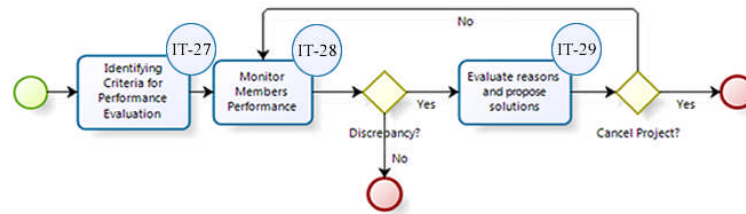
**Figure 7. Manage Knowledge Workflow Instructions**

As shown in Figure 7, this workflow starts with the identification of strategies and what types of knowledge will be managed during project implementation. Later, these settings will be used as the basis for carrying out the activities of collecting, monitoring, filter and knowledge sharing among team members.

### 3.7. Manage Performance

The activity manages performance focuses on make constant evaluations, whether formal or informal, on the performance of its members while working on their activities. The importance of its application is emphasized, especially because people cannot always play what is expected of them, which may result in a discrepancy between the planned and realized.

Thus, when identified, it is necessary that your manager adopts measures that seek to correct them or at least minimize them. Figure 8 shows the workflow instructions defined for this activity can meet the expected results GRH8 and GRH10 of the MR-MPS-SW.



**Figure 8. Manage Performance Workflow Instructions**

As shown in Figure 8, this workflow starts with the definition of the criteria used for evaluating the team member's performance. Based on this, the manager can identify if there was a discrepancy between the planned and carried out and, as appropriate, evaluate the reasons and propose remedial solutions to the problems identified. If these are not addressed, it is necessary to address, it is necessary to continue the project to be discussed among stakeholders.

Finally, in order to perform a validation and analysis, Table 3 shows how each of the results expected by the process GRH of MR-MPS-SW are serviced by workflow instructions presented in the previous sections.

**Table 3. Mapping of Expected Results and Workflow Instructions**

Expected Results	Workflow
<b>GRH1</b>	IT-11, IT-06, IT-14, IT-15
<b>GRH2</b>	IT-14, IT-15, IT-13
<b>GRH3</b>	IT-16
<b>GRH4</b>	IT-16, IT-26
<b>GRH5</b>	IT-16, IT-26
<b>GRH6</b>	IT-24
<b>GRH7</b>	IT-25
<b>GRH8</b>	IT-28, IT-02
<b>GRH9</b>	IT-03, IT-30, IT-31, IT-35
<b>GRH10</b>	IT-05, IT-27
<b>GRH11</b>	IT-34

As shown in Finally, in order to perform a validation and analysis, Table 3 shows how each of the results expected by the process GRH of MR-MPS-SW are serviced by workflow instructions presented in the previous sections.

Table 3, the expected results by the GRH process are served by at least one set of work instructions for activities. It is evident that not all instructions are used to meet the MR-MPS-SW, more than that, the flows were defined so that, through its execution, quality and objectives proposed by Horita et al. (2012) activities H2B could also be achieved.

#### 4. CONCLUSIONS AND FUTURE WORK

Managing people is not just to define roles, functions and allocate activities. In software projects, where one can hardly predict how changes occurred, it is necessary that your manager knows how to work, develop and constantly motivate its members to enable them to perform their activities always looking its increased quality and productivity.

This work aims to contribute to improving the software quality presenting some workflow instructions that aims to enable and enhance the human resources management available for the project; this new approach was named H2B-MPS. For this, we used the main activities that compose the model presented by Horita et al. (2012) and, for each one, we defined a specific workflow instructions that aim to meet each of the expected results required by the GRH process of MR-MPS-SW.

Although the H2B-MPS has not gone through a formal evaluation, Finally, in order to perform a validation and analysis, Table 3 shows how each of the results expected by the process GRH of MR-MPS-SW are serviced by workflow instructions presented in the previous sections.

Table 3 shows the evidences that show the adherence proposed model to the expected results required by the GRH process of MR-MPS-SW. Because of this, as a future work, in order to validate the proposed model, we propose its application in a software project. Furthermore, we intend to work on the development and integration of multi-criteria support to assist in the selection and allocation of members based on the work present by Gomede & Barros (2012).

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