A Kind of Change Management Method for Global Value Chain Optimization and Its Case Study

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Guangyu Xiong, Huaiyu Wu, Petri Helo, Xiuqin Shang, Gang Xiong, Rui Qin, and Fei-Yue Wang *Fellow, IEEE*

***Abstract*—Any successful change in an organization requires an appropriate change management method and a process for involved staff and department to accept the change and become engaged in order to achieve its success. It is even more important and difficult to adopt a novel change management method to bring multiple organizations across the business value chain into the change implementation. This research does not focused on change management within a single organization, but rather emphasizes a change management method including an appropriate change framework, well-defined Critical Success Factors (CSFs) and related tools for implementing change in multiple organizations. The paper introduces one kind of change management method to support a process change through Global Value Chain (GVC) in multiple organizations, and the method is used in a case study to achieve a successful change. In order to succeed in optimizing GVC performance, this research applies the proposed change management method to the case GVC, to support technical change by obtaining the staff's full commitment and engagement. The achieved results from the case study prove that successful change comes not only through technical solutions implemented in the problem process throughout the GVC, but also through strong support and engagement from all organizations and involved staff. The proposed change management method not only helped the case GVC to implement change successfully, but also can help the relevant multiple organizations to improve GVC performance and add value by optimizing their problem process.**

***Index Terms*—Change Management, Global Value Chain, Critical Success Factors, Change Framework**

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I. Introduction

Today, many organizations try to implement changes for improvement to meet situations of intense market competition. However, relevant researches and experience shows that most organizations have gained very limited benefit from the change implementation, and researchers and consultants have found that it is often because staff have not been effectively engaged in the change process [1-8]. Even though numbers of consultants and researchers have studied and developed methods of change management in order to enable organizations to make change happen and achieve success, failures are still more common than successful change. One research survey estimates that despite all the research done on change and transformation in recent decades, a large proportion of change initiatives have still failed to deliver, with successful levels of change being as low as 10% [2,6]. This brings the need to create an appropriate method to facilitate change, namely change management, which is the discipline including the methods, tools and processes, and can guide organizations to prepare, define and obtain the needed supports in order to implement organizational change successfully.

In fact, change does not only happen in a single organization, but also happen in several organizations simultaneously, where businesses are linked to a value chain encompasses a range of activities, and multiple organizations can bring value to products/goods or service from conception to end use and beyond. A value chain of manufacturing can include activities such as design, sales & marketing, production, service, distribution & support to the end consumer. According to IfM, Cambridge [9], a manufacturing (or service) organization can be regarded as a system made up of subsystems, each with inputs, transformation processes, and outputs. The major players-participants across the chain are typically monitored with Key Performance Indicators (KPIs), which reflect and measure the performance of behaviors in the process throughout the value chain. Change is always needed when KPIs performance does not meet the expectations of the involved organizations. Poor KPIs are mostly caused by related processes that are not well designed and need to be improved: we call this type of process as "a problem process". In fact, many organizations pay more attention to implementing technical solutions in making changes in a problem process rather than exploring change management methods to support staff to obtain the engagement during the change. This neglect of staff's reactions to change leads to more obstacles to the success of change. It is even more important and difficult for implementing change in multiple organizations than in a single organization. There is

the limited contribution from existing researches to emphasize the importance of change management for multiple organizations throughout the value chain to optimize its performance, in addition to technical solutions to improve the problem process. Therefore, developing appropriate methods to support technical change and also gain support from individuals also presents a major challenge. Moreover, little existing research contributes to success or failure measurement regarding the change management implementation.

In order to fill this gap in existing researches, we present a change management method with Critical Success Factors (CSFs) and related tools for change management in the value chain including multiple organizations. This research does not focus on technical solutions to optimize a Global Value Chain (GVC) problem process, but instead this research develops a change management method to support a technical solution for change in the problem process through the value chain, and the proposed method is applied to a case GVC and improve its KPIs successfully.

The paper is organized as follows. Section II presents a brief literature review of change management. Section III presents the research methodology. Section IV includes the case study, followed by the proposed change management method for optimizing GVC process applied in three manufacturers' organizations throughout the value chain. Section V presents the achieved results and its discussion, draws conclusions, and suggests further research areas.

II. Literature Review

A. Concept of Change Management

An organization has to change for many reasons, which include external drivers deriving from current market conditions and business competitors, or internal drivers, such as poor performance from operations or the organization's own strategic development. Especially when business growth and profitability are at a premium, producing positive change is a requirement [1-5].

According to many researchers, change management is a process where common traits and tools can be identified and applied [1]-[8]. With respect to the success of the change method, two streams of contribution can provide the basis for review. Stream one emphasizes the systematic change management method. The second stream concerns CSFs contributing to the success of change, and both streams include critical factors in the area of leadership, teamwork, communication, amongst others.

Regarding the first stream of research, many researchers have proposed models, methods and frameworks for the change. Prosci founder Jeff Hiatt developed the ADKAR model, which posits the following five elements for implementing change in organizations [4]: 1) **A**wareness of the need for change; 2) **D**esire to make the change happen; 3) **K**nowledge about how to change; 4) **A**bility to implement new skills and behaviors; 5) **R**einforcement to retain the change.

The above five elements provide clear guidance for organizations to prepare for change. Usually, the selected approach to change management will be implemented with the objective of changing areas related to the management's decision. The ADKAR model can guide organizations to obtain a better understanding of the focused areas that need to be taken into account. However, the ADKAR model does not provide a detailed logical implementing process to support change. In order to have a clearer, structured process to help implement change, Professor John Kotter introduced an eight-step model of the change process. Kotter introduced his eight-step change process in his book [2], which was subsequently called "Kotter's 8-Step Change Model". Kotter's model sets out a procedure of organizational change. J.S. Oakland and Stephen Tanner developed an even more detailed change framework for organizational change, as shown in Fig. 1 [4]. The framework helps an organization to set up and deliver a program for change, which contains two key parts on how to achieve change successfully, namely readiness for change and implementing the change. Within these two main areas, certain steps are sequentially identified as appropriate for an improvement project for change, which include the need for change, leadership and direction that set out the expectations, planning for communication, organization and resources, system controls, and behaviors that will reinforce the change.

The framework provides a clear theoretical framework for change that can be applied for implementing change in an organization towards an improved/re-engineered new process. The framework also leads to a loop, which means that when the new process results in the expected achievements, the organization may take further steps for continuous improvement by new triggers.

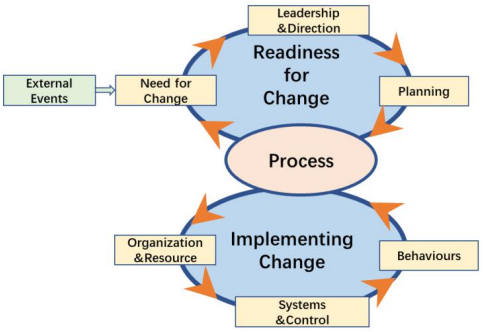

Fig. 1. Organizational Change Framework [4]

The case study in this research has combined this version of the change framework with the improvement process, and extended it to a change framework for value chain improvement. The proposed extended framework with more applicable tools and CSFs aims to support implementing change in the case GVC. Moreover, elements of the ADKAR model are integrated with related processes in the extended framework for successful change, which will be described later.

Along with developing global business and markets, more and more changes can be implemented across several organizations and even across countries. However, regarding existing research on change management methods, most emphasis is still on implementing change within a single organization. With the rapid development of global business, there is also a need to implement change for supply chain improvement that may involve multiple organizations. Tajri and Chafi [10,

11] analyzed three key practices of change in supply change management: the Enterprise Knowledge Development–Change Management Method (EKD-CMM), the information system urbanization method (IS Urbanization), and the Supply Chain Operations Reference Model (SCOR) method [12]. They summarized these and pointed out that three levels need to be considered for supply chain management: the process level, intentional level and information system level, based on analyzing the practices of changing cross-organizations. These three levels reflect the objective of change from the viewpoint of an improvement project: why the change needs to be made, and giving clear information about the change going through the involved departments or organizations. However, these methods in practice still emphasize the technical solutions involved in process change rather than the perception of staff, including buy-in, true commitment and engagement. The proposed method in our research emphasizes a change management method which involves the staff's perception in order to support the process of change and improve the smoothness in implementing the change.

The above review underpinning the first stream of research on change management methods can facilitate the implementing of change in organizations. However, besides this stream on steps and processes of change, another stream of research on CSFs for successful change has been suggested by researchers and featured in articles, which is combined with stream one in order for secure successful change.

B. CSFs for Successful Change

According to the second research stream, it is essential for top management to identify the CSFs to prepare for implementing change. By being aware of the CSFs in relation to change, top management can reduce the risks during a period of change. Various authors and researchers have identified several common critical success factors essential to minimizing resistance to change. Among them, Kotter [2] points out the importance of the leader's role, and Higgs and Rowland [13] propose a model to identify the competencies associated with effective leadership in a period of change, which can lead to a real understanding of the critical competencies required and help to build up the change capability within an organization. Oakland and Tanner [4] state that leadership can be linked to financial pressure, when a project management method can be most successful when implementing change in response to financial pressure. They also find that the softer side of managing change is relevant to staff, referring to the staff's behavior and corporate culture. Moreover, they point out that learning is very important, and organizations can develop appropriate learning during change, which is valuable when responding to future change in developing the business.

Teamwork is also a critical key. The Tuckman model developed by Tuckman [14,15] suggests five stages for team development during essential change, namely forming, storming, norming, performing and adjourning. Regarding Tuckman's model, the effectiveness of change differs in different stages with team work: as the team develops maturity and ability, relationships are established, and the leader changes the leadership style. The case study in this research has also used Tuckman's model for team dynamic development, and it is illustrated in the next section.

The attitude and behavior of staff are a big challenge to securing a successful response to change, and this is also an important CSFs. An organization should be aware of the natural change in the staff's attitudes, and the necessary communication must be made and and kept repeatedly for the entire change period to help staff develop positive attitudes and the behaviors needed to adapt to the new way of working. K*ü*bler-Ross [16] developed the famous Kbler-Ross model to help understand the behavior of staff during change. The model illustrates the five stages of grief: denial, anger, bargaining, depression and acceptance. With this model, the organization should be able to foresee the attitudes of staff towards the implementation of change, and all these can be worked through along with the change, and the ultimate stages of commitment and engagement can be reached. Price and Lawson [17] propose a holistic perspective, and the psychology of change management states that there are four basic conditions which need to be met before staff will change their behavior, including: a compelling story; role modeling with the desired behavior; reinforcement systems–related structures, systems, processes and incentives; and the skills required for change, which may require related training.

Some researchers and authors have suggested CSFs for change in organizations based on summarizing the outcomes from literature reviews on continuous change processes. As an improvement project is a suitable way to implement change, many organizations have used this way. The CSFs are identified by some researchers according to the improvement project. Oakland and Tanner highlight the major CSFs for effective implementation of change through project in organizations, as follows [4]: 1) Project champion; 2) Management commitment; 3) Project management; 4) Natural work team process; 5) Use of consultants. Gerkhardt [18] provides a model that gives an overview of the critical success factors for change management. According to the Gerkhardt model, a change project should be managed by working through twelve factors, as shown in Fig. 2.

Fig. 2. Twelve CSFs for change management (Gerkhardt [18])

Based on reviews of literature and discussions with the leaders of Six-sigma projects (one type of improvement project), Anbari and Kwak [19] identified the CSFs for successful Six-sigma implementation projects, as follows: 1) Management

commitment, organizational involvement and project governance; 2) Project selection, planning, and implementation methodology; 3) Six-sigma project management and control; 4) Encouraging and accepting the cultural change; 5) Continuous education and training. The above CSFs are adopted into other types of improvement projects, including value chain projects that are in focus in this research.

Furthermore, based on numerous change management studies, researchers in IBM [20] and McKinsey [21] point out that the most important CSFs can be simplified as communication, employee participation and top-management commitment. According to their research, the above three factors are thought to be the most important factors influencing the outcome of a change, even though there are also many other CSFs listed in this paper. In fact, various organizations need to develop more detailed CSFs based on their own specific situations, even though there are some CSFs common for most organizations.

C. Speed in Implementing Change

There are more specific discussions on implementing change introduced by some researchers. Kanter et al. [22] and Burnes [23] discuss the critical topic about the speed of change. They indicate that major change requires rapid implementation without wide discussion to avoid unplanned uncertainty. However, according to Oakland and Tanner [4], one important CSFs is the use of consultants and wide consultation if possible in order to achieve effective change, and widespread communication of oncoming organizational change is also suggested by IBM [20] and McKinsey [21]. As Bamford and Forrester [24] denote, rapid change should be based on the situation that all stakeholders involved must be willing and cooperative in implementing change. Therefore, this is a key to managing the pace of change in practice.

D. Gaps in Previous Research

As the review above states, many researchers are looking for stream one in a systematic way to help effective change, and stream two in defining CSFs for organizations to provide the conditions to produce successful factors for change. However, there are parts missing from existing research. Firstly, regarding stream one, most methods or models just consider facilitating change within a single organization. Limited consideration has been taken to change across organizations, Tajri and Chafi [10, 11] analyze the three key change management practices in supply chain management, and their research emphasizes the technical solutions needed to change a problem process rather than the change methods to gain a buy-in and strong commitment from involved staff. In fact, the staff's perceptions and attitudes are the most important factors to succeed in changing a problem process. Secondly, a good systematic method to support change should pay attention to the models and CSFs as a whole. However, stream one (systematic change management method) and stream two (CSFs) are discussed separately in most existing articles. Thirdly, little existing research provides appropriate performance measurement to measure whether the applied change management is a success or failure.

E. Contribution of This Research

To fill the research gap, our research proposes a change management method applied to multiple organizations that integrates related CSFs for change with multiple organizations. The main contribution is to integrate change management with project management in the industry in order to achieve process improvement, and it includes the following aspects:

(1) This research proposes a change management method for GVC optimization;
(2) Well defined CSFs for change in a GVC are combined with a change framework with associated tools and defined measurement, which takes the process change into consideration in order to achieve successful change;
(3) This also provides an effective change management method to implement change across a single organization;
(4) Good results from the change management method applied in the case study provide the best practice for implementing change across multiple organizations in a GVC.

III. Research Methodology

A. Research Design

This research work develops a novel method of change management across multiple organizations. Because of the new application field, the research contributes value to both change management methodology and value chain optimization.

Case-based research is appropriate for implementing change to the problem processes across functions within an organization, and to multiple organizations throughout the value chain. Based on the literature review, two streams of contribution to this research are considered and extensively applied to the case study. With the help of the proposed change management method, change management is intergraded with project management in the case value chain to make a successful change in the problem process.

Organizations in this research include three manufacturers in a GVC, which involves several participants from upstream to downstream along the chain, and their relationships in between are business partners-supplier and customer. As the existing problem for the three organizations is poor delivery KPI, which needs to be improved, so change is required. In order to make a successful change across multiple organizations, a cooperative GVC improvement project is one way for all participants to work together and make change happen. However, an agreement on working together is just the first step of the long journey, and further steps related to any change in the current way of work are needed.

In order to effect successful change to a problem process across the three organizations, a change framework was applied, which was extended from [4] and using tools and identified CSFs that the specific case needed in order to deal with challenges or barriers during the implementation of change across the three organizations.

An improvement project is one effective way of implementing change, and it needs to apply some relevant systematic methods to produce a better performance in the problem process, such as the Lean approach [28] developed from

Toyota Production System (TPS), Six-sigma introduced by engineer Bill Smith while working at Motorola in 1980 [29], Theory of Constraints (TOC) [30] developed by Goldratt, and supply chain/value chain improvement developed by SCOR framework developed by The Association for Operations Management and Supply-Chain Council (APICS-SCC) [12]. An improvement project aims to achieve better performance in operational processes and value chain by optimizing a problem process. As improvement means change, it requires change management to facilitate the change during the project period.

The GVC optimization in this research is one improvement project to implement change. When a major change takes place in the value chain throughout multiple organizations, the project team must face more challenges; therefore, change management is always a top priority task. The case study applies a systematic method to produce effective change in new ways of working, and to replace old and problematic processes.

B. Change to Global Value Chain

The Global Value Chain (GVC) is defined in the same way as value chain, but with its activities across countries, or even continents. According to Gibbon et al. [28], value in the GVC has two components: 1) how and by what processes value is created; and 2) how and by what processes the resulting value is distributed.

For manufacturing, GVC integrates multiple organizations along the stages of production and in multiple offshore locations, and organizations can divide their operations across the world; a single product often results from manufacturing and assembly in multiple countries or organizations, with each step in the process adding value to the end product. Geographically, a GVC consists of several organizations from different geographic locations or countries. According to De Backer and Yamano [29], GVCs are characterized by the functional and spatial fragmentation of activities in a firm's value chain, including production, distribution, sales and marketing, R&D, innovation, and other functions. Gereffi et al. [30] stated that the GVC can greatly speed up the globalization process due to the advantages of low-cost workers, increasingly capable manufacturing and trade infrastructures, and plentiful raw materials. However, the GVC process faces more challenges compared with processes within single organizations, and delivery performance reflects the most critical problem - delivery throughout multiple organizations.

In this research, along the value chain, the organizations can be called "nodes" in the chain, and the organization of nodes can also be called "participants". All participants in the entire chain need to cooperate more effectively to create the maximum added-value for all participants. To meet the expectations of good performance, the optimization of GVC is required and an appropriate method to facilitate change is very important to implementing change successfully.

The GVC optimization in this case study is to implement change in a problem process. According to the SCOR framework developed by APICS-SCC [12], the structure of level 1 processes in the chain include plan, source, make, deliver, return, and enable. All processes are associated with the participants (organizations), such as the upstream suppliers' supplier process, and delivery to downstream participants, such as the customer and the customer's customer process, across the entire chain. Obviously, all participants are linked along the chain; therefore, they need to cooperate in effecting the change to obtain good performance.

The structure of the GVC in the case study is shown in Fig. 3, and it displays three major participants (organizations) linked to the value chain. The participants with roles in the chain are as follows:

(1) Manufacturer A was the most problematic supplier, whose delivery time was very poor for its direct downstream customers-Manufacturer B, and supplied product A-one important part-to Manufacturer B;
(2) Manufacturer B was a component supplier, and it supplied its product-component B-to its downstream Customer-Manufacturer C;
(3) Manufacturer C was a power product supplier in the Asia-Pacific region.

Of these participants, Manufacturers A and B were located in Europe, and they delivered product globally. Manufacturer C was one of most important customers for Manufacturer B and was located in Northern Asia, and Manufacturer B was also one of the most important customers of Manufacturer A. The three participants were strong competitors in the relevant market.

Regarding GVC performance, customer satisfaction should be a key, reflecting some specific KPIs: order delivery-time to customer, On-Time-Delivery (OTD), and inventory along the chain, etc. The case study describes how the change management supports change implemented along the GVC to achieve better KPIs.

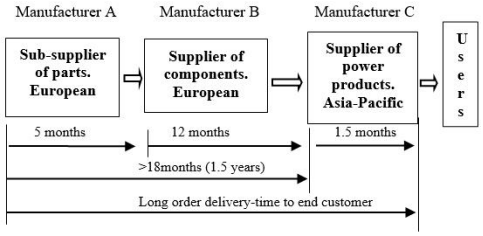

Fig. 3. GVC structure with major participants

C. Data Definition and Collection

KPIs data is always used to measure the performance of a process to monitor whether the process works well. In the case study, eight major KPIs, as shown in Table I, are defined, which can reflect the process behavior along the GVC, as well as the success of the change. The definitions of KPIs are given in detail as below:

Definition 1 (Ratio of delivery on time from Manufacturer B to C, OTD_C)**.** *The percentage of deliveries on time from Manufacturer B to its downstream customer- Manufacturer C in the time period that both agreed (%),*

OTD_C = (the number of orders delivered to manufacturer C on time/the total number of orders shipped to manufacturer C)$\times$ 100%.

TABLE I
MAJOR KPIS DEFINITIONS

Major KPI	Definition
OTD_C	Ratio of on-time-delivery from Manufacturer B to C
D/T_{BC}	Average order delivery-time from Manufacturer B to C
D/T_{AB}	Average order delivery-time from Manufacturer A to B
WIP_B	Work-in progress in Manufacturer B
$OH-D/T_C$	Average delivery-time for order handling process in Manufacturer C
$Nr.$-contracts	Numbers of improved contracts between Manufacturer B and its suppliers
$Eff-G_n$	Grade of effectiveness of communication for change management
OSC	Overall index of successful change management

Definition 2 (Average order delivery-time from Manufacturer B to C, D/T_{BC})**.** *The average time quarterly spent on an order started from entry at Manufacturer B until the goods were received by Manufacturer C.*

D/T_{BC} = $\sum$ *# time spent on all processes for delivery of one order through the value chain from Manufacturer B to Manufacturer C (month).*

Definition 3 (Average order delivery-time from Manufacturer A to B, D/T_{AB})**.** *The average time quarterly spent on an order started from entry at Manufacturer B until the goods were received by Manufacturer C (month);*

D/T_{AB} = $\sum$ *# time spent on all processes for one order through the value chain from delivery by Manufacturer A to Manufacturer B (month).*

Definition 4 (Work-in-Process in Manufacturer B, WIP_B)**.** *The number of work-in-process of production line components on a daily basis (#);*

WIP_B =$\sum$ *# Work-in-Process daily on average monthly.*

Definition 5 (Nr.-contracts)**.** *The numbers of improved contracts between Manufacturer B and its suppliers;*

Nr.-contracts =$\sum$ *# improved new contract.*

The above data on the five KPIs reflect the behaviors of processes throughout the GVC, and successful change as well. These data can show the results of change to the problem process (i.e. the data monitoring can show the trend before and after the change). To strengthen the visualization of successful change, two more KPIs are defined and more directly linked to the effectiveness of change management, as below:

Definition 6 (Average order delivery-time for the order handling process in Manufacturer C, $OH-D/T_C$)**.** *The period of time between the entry order and order confirmed (day) by Manufacturer C.*

$OH-D/T_C$ = *Date of order confirmed in Manufacturer C–Date of order entry in Manufacturer C (day).*

Definition 7 (Grade of effectiveness of communication, Eff-Gn)**.** *The grade of effectiveness of communication with staff according to the communication plan. It contains three grades of low/medium/high for two dimensions–credibility and perception of change, which can measure the effectiveness of communication actions. The monitoring needed a relevant brainstorming workshop arranged by sub-project P_n (the process for collecting feedback is described in the next section)*

Eff-Gn = Grade level of effectiveness of communication (L/M/H: L = Low; M = Medium; H = High).

The process of monitoring and collecting Eff-Gn is as follows:

(1) Organizing a brainstorming session with representatives from the impacted population;
(2) Asking each participant to write on a post-it note what they understood about the change in the relevant process that could impact their work;
(3) Asking the participants to put the post-it notes on the matrix on the wall or on flip-charts.

The project team summarized the results of the feedback by collecting post-it notes that could show what the staff thought about the credibility for change. The first round of the process was performed at the beginning of the project. The same process was repeated when most changes for the relevant process had been implemented, and the defined communication plan was followed during the change. The effectiveness of communication would be shown by a comparison of the collected post-it notes. In the case study, the project team used the defined process to measure the effectiveness of the communication plan and activities for involved personnel and team members. The collected data (before and after) is shown in the next section.

The overall success of the change can be measured overall by both technical method on process improvement and systematic method on change management applied for project management. Therefore, there could be one overall KPIs for change supported by different focused areas, including the change process that can be reflected in KPIs of process throughout the chain, and people's change that can be reflected in KPIs of the level of people's buy-in and of supporting change through the communication of change management. One overall KPIs of success change management can be defined as follows:

Definition 8 (the overall index of successful change management, OSC)**.** *Overall successful change combined with process improvement and people's change:*

$$OSC = C_p \wedge P_p,$$

where $\wedge$ is logical conjunction; C_p is successful change in process, C_p=1(success), if all of OTDC, D/TBC, D/TAB ,WIPB, OH-D/TC reach target of change, and $C_p = 0$ (failure), if any of OTDC, D/TBC, D/TAB ,WIPB, OH-D/TC did not reach the target; P_p is successful change in people's behaviors to commitment on change, $P_p = 1$(success), if both Nr.-contracts and Eff-Gn reach the target, and $P_p = 0$ (failure), if both Nr.-contracts and Eff-Gn did not reach the target.

In short, among the seven KPIs in Table I, the first five KPIs were collected to measure the process along the GVC, and KPIs 6 and 7 were specifically defined to measure some benefits of effective communication for change management. Moreover, KPI 8 was reflected in overall successful change. KPIs 1-5 were for performance measurement on process improvement along the GVC; however, the improvement was achieved not only by technical solutions to problem processes, but also from how the change management method, with relevant tools and activities reflecting the identified CSFs,

could make staff and stakeholders from all the participant organizations engage with the change. KPIs 1-5 were collected by responsible people in corresponding sub-projects and assigned by the sub-project leader. All KPIs on process change were updated in a defined project database. KPIs 6-8 were collected in specific workshops or overall calculation as appropriate, and the project manager was the responsible person for the three KPI.

IV. Case Study

A. Problem Description

In the case GVC, three major participants (See Fig. 3) were linked along the chain. The major problem for all the participants was delivery performance. Fig. 3 shows that the order delivery-time was around 5 months from Manufacturer A to B, from Manufacturer B to C around 12 months, and the total delivery-time from A to C was more than 1.5 years. However, the expectation of delivery-time from Manufacturer C was around 6 months, which was acceptable in terms of meeting its customer's expectation. Therefore, a change had to be made to improve the poor delivery performance. This case study describes how the proposed change management method facilitated implementation of the change.

In order to implement change cooperatively, Manufacturer B and its customer-manufacturer C triggered an improvement project to shorten delivery-time and improve OTD from Manufacturer B to C. Then they invited the upstream supplier-manufacturer A to join the improvement project, as the delivery-time from A was one major issue of delivery performance for Manufacturer B and C. Finally, the three participants in the chain agreed to assign resources to engage the project and work together towards a change to better performance.

The main challenge of the project is how to shorten the delivery time. Based on the analysis, the main reasons for the long order delivery time are as below: First, long order delivery times from the upstream sub-supplier: Manufacturer A, and second, the availability of material or parts was the major reason for the poor OTD to Manufacturer C.

B. Challenges to Implementing Change in GVC

As stated previously, the change produces major challenges for any organization, and change in the GVC is even more difficult compared with a single company because of the complexity when involving multiple participants and change across the processes of several organizations. Among a number of difficulties, major challenges to the change management of GVC were as follows:

(1) Gaining support for and engagement with change from each of the involved participants' management, functions and staff along the value chain;
(2) Communication and cooperation along the GVC, both internally and externally, for each participant;
(3) Complicated project management across organizations, even across countries or across- continents (from the GVC point of view);
(4) Considering improvement actions for issues through an overall "big picture" that should consider whole chain optimization, instead of just local optimization or only focusing on own organization.

To overcome all the above challenges, a systematic change management method and relevant activities should be defined and followed to achieve successful change. As described previously, firstly the improvement project on GVC optimization took into account the change management method: the selected change framework was taken into account, including process, tools, and clear targets for change. Secondly, CSFs need to be identified, and the following actions must be defined and integrated with the change framework. Moreover, relevant tools must be considered, such as team development and individual reaction. All these applied methods and tools are described in the following sub-sections.

C. Making Change Happen

Based on the problem areas in the GVC, a project structure and team were created for improvement and better delivery performance, as shown in Fig. 4.

As Fig. 4 shows, the project was set up with five sub-projects relevant to areas and issues of problem process along the GVC. The top element, "Project Steco" (Steering Committee), with its most important responsibility, "Change Management", governed all the sub-projects (see Fig. 4). The Steco members included:

(1) The project sponsor from Manufacturer B: Manufacturer B was directly linked to the other two participants, and the GM in Manufacturer B took this important role;
(2) The project champion from Manufacturer B: this person could represent the top management;
(3) The leaders responsible for the sub-projects;
(4) The leader of the external consultants: the person and consultant team offered external support with rich professional knowledge and experience, both in the GVC approach and change management;
(5) The project champion: this role with responsibility is one important CSFs;
(6) The leaders of each sub-project: these roles were responsible for leading their sub-project to effect the changes in the related sub-project.

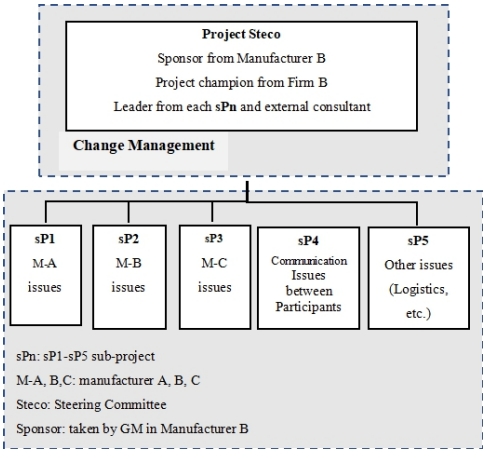

Fig. 4. Project structure

Five sub-projects are illustrated as follows:

(1) Sub-Project 1: this was led by a team from Manufacturer A. The main issue was a long order delivery-time with 5 months delivery of its parts to B;
(2) Sub-Project 2: this was led by a team from Manufacturer B. It took months to deliver its components to Manufacturer C, and also with poor OTD that was around 55
(3) Sub-Project 3: this was led by a team from Manufacturer C. As many complaints about delivery performance were coming from this manufacturer, it was eager to be involved and cooperate with the other participants for GVC optimization;
(4) Sub-Project 4: this was needed to solve issues of communication between all the sub-projects, and was managed by a team from Manufacturer B;
(5) Sub-Project 5: this was led by a team from both Manufacturer B and C, as issues that needed to be solved were relevant to problems that might be impacted by the two participants, B and C.

The project champion was the coordinator of all the participants. The main goal of the project was to shorten the order delivery-time and improve the OTD performance of component delivery to the downstream participants like Manufacturer C. To address the existing issue of the GVC, the project team defined the goals for the optimization to achieve a win-win situation along the GVC from all participants. The defined KPIs are described in the previous section.

Moreover, as shown in Fig. 4, project Steco and Change Management on top of the sub-projects (sP1, sP2) were aimed mainly to develop support for change and obtain the engagement of the staff. This set-up also corresponds with the most important CSFs, which were illustrated in the previous section and will be analyzed in detail.

The Steco was mainly responsible for change management during the entire project period; in addition, there were also related activities to ensure that all the changes took place smoothly, namely defining and providing the necessary training on knowledge and skills to the project team, benchmarking if needed, defining communication along the chain, setting up the project KPIs with targets and monitoring them regularly, identifying risks and mitigation strategy, and monitoring the progress of the improvement project in order to ensure all the activities met the improvement project objectives.

D. Key CSFs for Successful Change

In terms of the previous descriptions, CSFs should be identified to realize change effectively and smoothly, and then action corresponding with CSFs must be defined and followed to achieve success. Combining the survey in the previous section with actual circumstances in the case study, the major CSFs and more detailed CSFs based on specific circumstances of the GVC were identified and agreed on by the project team, as follows:

(1) Strong commitment from the top management of each participant, as pointed out by IBM [20] and McKinsey [21].

To obtain the commitment of all three organizations at the beginning of project, the project team calculated an estimated financial loss data caused by the current GVC (before implementing change), and showed the data as evidence to the top management in each organizations. The estimated financial loss data promoted a good understanding for the top management, it led the top management of participants realize the necessity and urgency of the change. Therefore, Strong commitment from the top management of all the organizations (Manufacturer A, B, C), was secured at the beginning of project and continued throughout the entire project period.

(2) An excellent project champion.

A project champion has a key role in implementing change across the value chain compared with the same role for change within a single organization. The project champion should be a person who would not only be accepted within one organization, but also be popular in three organizations. He/she must take on the burden of ensuring everyone involved on board, and be behind the ultimate success of the project [4].

According to these requirements, the selected project champion should act to coordinate different participants throughout the chain in addition to his/her professional competence in terms of the GVC concept. The criteria for project champion were defined as follows. The person should:

- Be an advocate and expert on the GVC concept, and be able to sell GVC optimization to the project team
- Have excellent skills in project management;
- Be good as a manager on the executive level and in GVC optimization and change for multiple organizations;
- Be capable of linking the performance of local KPIs with the major KPIs of GVC towards the target of GVC optimization;
- Be capable of motivating individuals and teams, and communicating with all participants across functions and value chain;
- Be eager to learn new things that the GVC and change management require.

Finally, a project champion was selected from the supply chain department at Manufacturer B who met the above criteria. Moreover, the champion was very young and could easily learn and accept new things. Meanwhile, he knew key persons from the other participants as he was working in supply chain management, so that he was accepted and trusted by all participants.

(3) Good change management plan integrated with the project management plan.

A change management plan integrated with a project management plan can minimize the negative impact of change on the business, employees, customers, and relevant stakeholders. Usually, the project management plan includes a clear definition of the objectives of the project, a developed Project Execution Plan (PEP) with milestones, resources, a budget, etc. Then the progress of the project needs to be careful tracked and updated regularly during the project period. To achieve successful change in the GVC, the change plan must be defined together with the project management plan in order to handle varying degrees of complicated changes from different organizations, and quickly pivot and navigate the changing landscape along the GVC. As Fig. 5 shows, the created change management plan included the following major strategies, which were also detailed CSFs and reflected

elements from the ADKAR model [5]. In detail, the change management plan included the following elements:

- Showing strong reasons for change: This is in line with the first element in guiding change, as stated by the ADKAR model: awareness.
- Defining the clear scope of change: This includes the problem process, functions, staff with roles, poor performance, etc. The project team makes the process clear in the beginning to everyone so that involved staff can clearly see the future circumstances.
- Identifying stakeholders that will impact the change of GVC: The stakeholders included the three organizations, as well as the relevant functions and staff involved from each organization. During the project period, the project team interacted with all the stakeholders and addressed concerns in order to achieve a smooth change. Meanwhile, the clear responsibilities of the stakeholders were defined, so that everyone was not only informed, but could also contribute to the change if necessary.
- Identifying and showing the benefits of the changes: All the benefits must be based on solid analysis and be acceptable to the three organizations. One action was that a systematic assessment of the current status of the GVC was made: the report on assessment not only showed issues of the current GVC, but also provided information on the financial benefits from further change. This reflects the second element in guiding change as stated by the ADKAR model–the desire to change.
- Fully understanding the project goals: A clear definition of performance was defined (see Table I), and its target KPIs based on change were proposed and agreed by the three organizations, as well as the deliverables from the project. Once the goals were agreed, Steco and the project team had to keep them in mind, and all the activities undertaken were directed towards the targets.
- Identifying risks with mitigation activities: This task was set out when the project was started, and updated at each project stage in order to keep the change smooth. Table III shows that the first version of risks was defined during the project assessment, then the project team with all the stakeholders defined appropriate mitigation activities. Varying with the project status, the risks and mitigation had to be updated in order to keep the project running in all the organizations without major barriers.
- Creating an effective communication plan: Good communication shared all necessary information with all the team at the three organizations, so that the involved staff had accurate information on time and avoided having to 'guess and stress'. To do this, an active regular communication plan was set up and followed to keep the communication open, on-time, and smooth, including weekly video-meetings with Steco and major project members, and regular phone meetings in case of any issues.

(4) External consultant plays a unique role in driving successful change in organizations.

In the case study, external consultants were involved from the beginning. The work of the consultants not only provided and developed specific technical solutions, but they were also deeply involved in project management together with the team. The external consultants worked as facilitators of all the defined improvement areas and activities. The project gained benefit from professional facilitation and received valuable guidance from high quality consulting work. In particular, the consultants made a great contribution to building knowledge, ability, and reinforcing and sustaining change, as suggested by the ADKAR model.

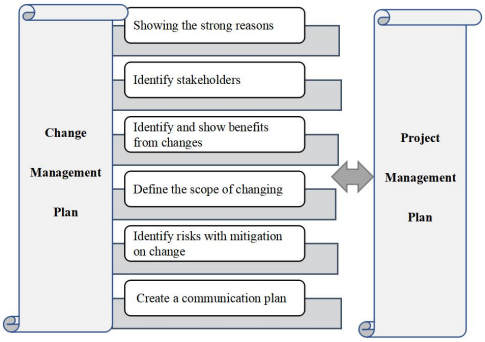

Fig. 5. Change management plan show strong reasons (not showing the strong reasons)

Besides the above major CSFs, more detailed CSFs and corresponding actions were also defined in each sub-project according to the specific situation in each manufacturer. The following sub-section emphasizes just two noteworthy events that show how change happens and how support is obtained from upstream suppliers externally, and production staff internally, in Manufacturer B.

E. Change Framework Applied to GVC Optimization

To integrate the change process with project management, Oakland and Tanner's framework (Fig. 1) was extended and developed into a new version of change framework in the case study that corresponded to project process and actions at different phases (Fig. 6). The key point of the framework was to keep communicating and involving people in the entire change process. In terms of the GVC optimization phases, the project team followed the guidance of the framework in two areas and integrated it with preparation and execution of change to problem processes throughout the GVC. In more detail, during the project preparation phase the motivation to change needs to be identified and clarified, and the need for change must be created, leadership and direction provided, and especially, the communication plan should be defined. All these steps are mapped with the major CSFs that were identified and described in the previous sub-section. Once these steps and CSFs are taken into account and related actions are defined, the readiness for change is completed. During the second phase–project execution, all actions for change are taken to change the old problem process according to the technical solution. From the change management viewpoint, the project team and organizations need understand the requirements from the organization and resources, and build up the systems and control to facilitate the change actions. The staff must be capable of following the new way of working; therefore, the behavior of staff should be monitored, and the

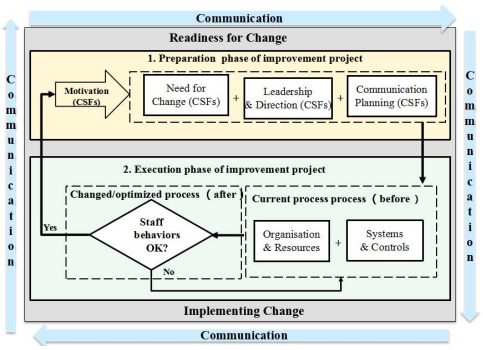

Fig. 6. Change framework for the case GVC

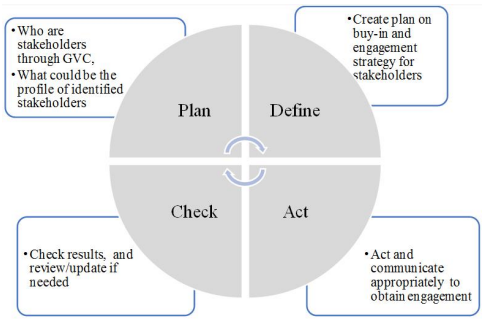

Fig. 7. Key process of communication planning (Note: stakeholders = the staff who might be impacted by the change)

change process has to be reviewed if the behavior of the staff indicates that the new process is not being followed, with one option being related training put into place. At the end, all new processes along the value chain should be verified to meet the KPIs targets. The framework of change is a cycle which keeps changing once any problems along the value chain are identified by the defined KPIs.

According to the framework in Fig. 6, two major areas of the change process needed the related actions to be taken to meet the required preparation and execution phases of the project.

The first area of the framework was the preparation phase reflecting readiness for change, and the elements and steps from the change framework on GVC optimization were defined as follows:

(1) Motivation for change: poor KPIs performances and financial loss caused by the problem process were a big issue for the three organizations, and all suffered from delivery problems. This issue motivated the three organizations to make changes.

(2) Need for change: the downstream Manufacturer C complained about the delivery performance from its supplier–Manufacturer B, as Manufacturer C was very important for the business of upstream Manufacturers B and A. All three organizations linked with the GVC had to make the decision to cooperate to improve delivery performance.

(3) Leadership and direction: Steco selected the champion and leader for each sub-project very carefully. During the change implementation, the project team always made decisions on the priorities of change at the appropriate time. Moreover, regular communication was always important and focused top-down through each participant's organization, as well as between the three participants. To strengthen leadership, all the defined tasks were distributed to the sub-projects, and the leader of each sub-project took responsibility for assigning the change tasks to the relevant staff, so that implementation was performed by the responsible person.

(4) Planning for communication: to gain buy-in and true commitment, the communication plan was created. Good communication should be consistent, and derived from the CSFs with defined corresponding activities. To achieve this, as Fig.7 shows, the communication process was defined as a cycle that included Plan-Define-Act-Check (PDAC). Firstly, all the stakeholders who would be affected by the change were identified; the project team then took time to analyze some stakeholder profiles and problems, and then defined the activities in order to obtain buy-in and engagement from the involved staff. All these needed to put in a communication plan - one major CSFs. At the end, the effectiveness of the communication need be checked: that was one KPIs which could measure its effectiveness. The most important issue was that the communication plan had to work through the entire project period and be checked and updated regularly with the cycle. Among all the activities taken to gain facilitation and engagement, there were two significant events for some stakeholders, both internal and external to Manufacturer B, and these are illustrated in the next sub-section.

The second area (see Fig.6) was the execution phase, reflecting the change happening, and the steps taken for implementing changes to problem processes along the GVC in order to optimize the delivery performance. At this project phase, the improved process must impact the organization and resources of each participant, as well as relevant systems and controls. The elements from the area were as follows:

(1) Organization and resources: new organizational structures need match the improved process with the staff's competencies and skills. One example was a new purchasing process based on the Lean principle. A relevant training session (significant event) was conducted for problem suppliers and staff from Manufacturer B, which is described in the next sub-section. The results show a remarkable improvement shown as KPIs in Table II.

(2) Systems and controls in GVC optimization: a new process to implement change led to more specific communication or methods to support new ways of working. As Fig. 8 shows, to support new ways of working the project team took into account policy, new processes or procedures, KPIs for new processes, relevant training of the staff's competencies or skills, benefit analysis, etc. All considerations reflecting the new way had to be converted to a system as far as possible in order to control uncertainty and lower the risks during implementation of the change.

(3) Behaviors in terms of change: with any improvement project, an optimized new process must replace old ways, and a new structure, new roles, and new competencies are needed; resources need to be re-trained and utilized, along with performance measures and process controls. All these must drive new behaviors. At this stage, in line

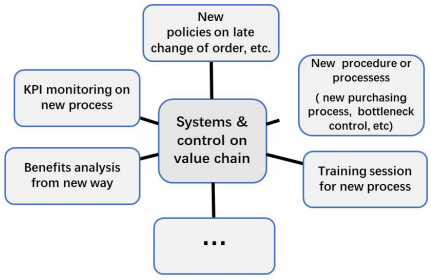

Fig. 8. System and control in a new way of implementation

with the elements knowledge in individuals and ability to implement a change from the ADKAR model [5], the project team defined the needed training to help the impacted staff develop skills and behaviors in terms of the new process, such as new purchasing method, new inventory strategy, etc. During the project, there were some concerns about the negative impacts on the staff's daily work. To solve this problem, time was taken to communicate on the proposal for the solution and the staff's concerns. Two significant events described in the next sub-section are training, plus a workshop to build up knowledge and skill for impacted staff and gain their support. One notable activity form was a workshop on change management arranged in each organization, in which the five stages from the Kbler-Ross model were discussed to help the three organizations understand the normal phenomena occurring during a major change. The key objective of the workshop was not only to provide training on the theory of change management, but also to overcome the staff's negative feelings and concerns.

F. Significant events for successful communication internally and externally

During implementation of the change, two notable events brought about the rapid and effective gaining of support from all organizations and internal participants in Manufacturer B. The two events were mainly facilitated by external consultants, which could be a new way to support change for value chain.

(1) Event gaining support and strong engagement from upstream suppliers

One important event for change was the specific supplier workshop, which aimed at gaining buy-in for change from several problem suppliers. With the help and facilitation of the consultants, the project team identified and invited in five problem suppliers, including Manufacturer A. The workshop session was structured, and consisted of pre-work, a simulation game (on supply chain management), training and discussions, and new solutions and negotiations started at the end of the session, with follow-up afterwards (see Fig. 9). The simulation game helped the suppliers to understand the problems of the current process. Other training and relevant discussion on the lean concept brought forward new ideas on how suppliers could improve the problem process, and new solutions and negotiations were started at the end of the session, with follow-up afterwards. For instance, a training was offered on Theory of Constaints-Drum, Buffer, Rope (TOC-DBR) for production

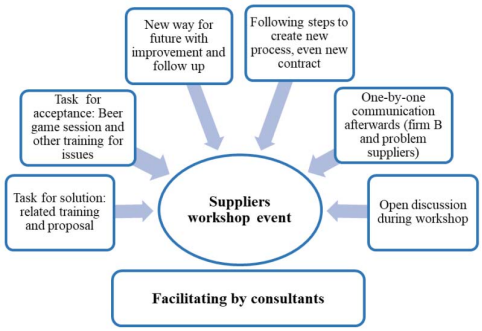

Fig. 9. Supplier workshop structure: training on issues

personnel, and this solution was used in the production line to limit Work-In-Process (WIP) in Manufacturer B.

There was a lot of positive feedback from the supplier workshop, and subsequently the invited suppliers were willing to take the next steps concerning changes to the problem process based on learning. At the end, the local team (Manufacturer B) was encouraged by good feedback and started to create a new purchasing process with those suppliers. From a change management point of view, this event achieved positive results: the suppliers were willing to work together to change and improve the problem process, and the major delivery performance was dramatically improved after buy-in and strong support from these suppliers (see Table II).

(2) Event securing support from internal personnel

During the project period, one important stakeholder–the production manager–together with some other team members on the shop-floor in Manufacturer B were strongly against change. The main reasons were as below:

- They were very concerned about the possible failure of change and consequent disruption to production.
- They were worried that the new solution for change needed time for testing or piloting, with consequent disruption to production.
- The production manager did not want to try the new way if most workers on the shop-floor were against it.

To help them understand and accept (buy-in) the ideas of changing the production line, another important event was designed. A simulation game on bottleneck control on the production line was prepared for the production line personnel. The main objective of the workshop was to gain their support and create new ideas for the control of WIP on the shop-floor. Again, with the help and facilitation of the consultants, following the workshop session the staff were able to see things in a new way through the production simulation game and understand how to decrease WIP through new ideas of production planning. As a result, the outcomes from the workshop were surprisingly positive: all the involved staff encountered new ideas, and the production staff even created more ideas on how to implement solutions on the shop-floor easily and rapidly in a pilot solution. Afterwards, the production staff applied solutions through this pilot scheme. The results were positive, WIP was decreased by over 30% on the piloted production line, representing a big saving. Clearly, this event not only gained buy-in from the production staff,

but also provided more ideas contributing to the project goal: the reduction of WIP, as well as improvement in OTD to the customer–Manufacturer C.

G. Results

With the change management activities integrated with project management, the improvement project on GVC optimization achieved a significant improvement. The positive change achieved success both from the optimization of GVC technically, and also in terms of change management. The remarkable result from the change shows that the project KPIs targets were reached (see Table II, Fig.10 and Fig.11).

As Table II and Fig.10 show, order delivery performance improved dramatically. In detail, the data collection shows that the order delivery time between Manufacturer B and C reduced from 12 months to 6 months; the order delivery time between Manufacturer A and Manufacturer B reduced from 5 months to 3.5 months; and OTD to Manufacturer C increased from 55% to 95%. KPIs monitoring also shows that WIP in Manufacturer B decreased from 90 units to 60 units daily, which produced an annual cost saving of about 1.2 million Euros. In addition, Manufacturer B gained a larger production capacity due to reduced WIP, so that more components could be produced. The most important thing is that all three organizations learnt to use the change management method integrated with project management to effect successful change, to make further improvement along the GVC, and to achieve reinforcement, coinciding with the "R" element from the ADKAR model.

The sub-project sP2 was for solving internal process issues in Manufacturer B, and the project team used Eff-Gn for tracking the effectiveness of the communication plan by following the process that was described in the previous section. The feedback was collected with post-it notes from the two sessions (before and after) and is summarized and shown in Fig. 11. The summarized Eff-Gn shows that more staff shifted to a positive trend in terms of attitude towards change after the communication activities were undertaken according to the communication plan: the supporting personnel who showed high perception and credibility increased from 2 persons to 14 persons. Besides the project team of sub-project sP2, other sub-project teams also made a similar effectiveness matrix to measure whether the relevant actions were effective. There is no need to go into details here as the process was the same.

In summary, significant benefits were achieved through the successful change. The applied change management method can also be extended to implement a change in multiple organizations involved. The findings from this research can be summarized as follows:

(1) Clear and agreed project motivations and objectives are the basis for multiple organizations - all participants cooperating in the change;
(2) A good project structure and a professional project team are always essential to effect change smoothly along the value chain with multiple organizations
(3) An effective communication plan for change integrated with the change phases is one important CSFs. In particular, well-defined relevant actions for communication through all involved staff and organizations minimize failure;
(4) CSFs should be identified in the very beginning, and relevant actions must be followed and updated regularly during the project phases. In particular, good cooperation and communication between all participants/multiple organizations are the most important CSFs;
(5) An effective change framework with change phases and steps, plus relevant tools and integration with identified CSFs is an efficient way for implementing change;
(6) Well-defined specific events required by change can function as accelerator to gain buy-in and contribute to controlling the pace of change along multiple organizations, and in functions within an organization;
(7) Appropriate training arranged for specific purposes to change the staff's behaviors is an effective way to match new requirements in new ways of working and is also beneficial in securing buy-in from the personnel.

TABLE II
KPIs ACHIEVEMENTS

KPI	Before	After	Target
OTD_C	55%	95%	90%
D/T_{BC}	12 months	6 months	8 months
D/T_{AB}	5 months	3.5 months	4 months
WIP_B	90 units	60 units (annual saving of 1.2 million euros)	70 units
$OH - D/T_C$	10 days	5 days	5 days
Nr. Of contracts	Old contract with old purchasing method	5 new contracts with improved purchasing method based on Lean	0
$Eff - Gn$ Note: sP2 team (feedback from 16 staff)	2 personnel with high grade in credibility and perception of change	14 personnel with high grade in credibility and perception of change	10
OSC	0 (no change before project)	1	1

V. Conclusions and Future Work

This paper illustrates a systematic change management method to support the implementation of major change for performance improvement in the GVC. The case study adopted the proposed change management method in the case value chain. The successful change was achieved by means of an appropriate change framework, tools and well-defined CSFs with activities during the project period. Without change management activities, most process change across organizations might be impossible, and the performance targets not attained or taken a longer time to achieve. The findings from the research will provide value to businesses implementing change in the similar multiple organizations, optimize the problem process, and achieve a win-win across organizations. The case study provides implications and best practice for similar change needs across GVC processes towards achieving improved performance. Further research on change management for cross-organizational value chains could be extended to new areas, for example:

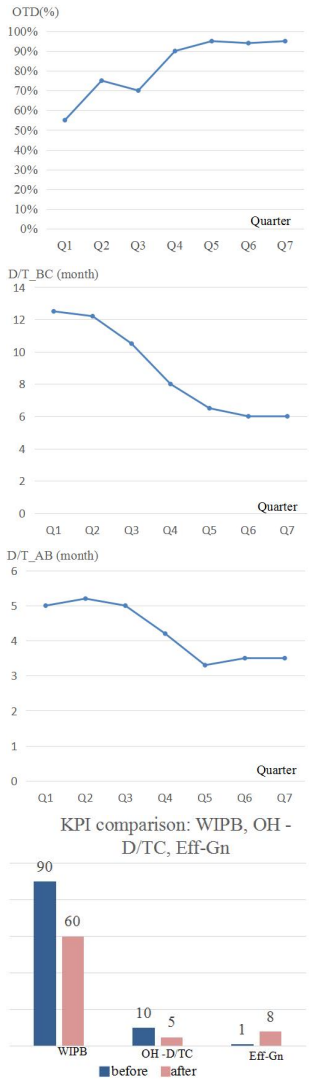

Fig. 10. KPIs performance's monitoring and comparison

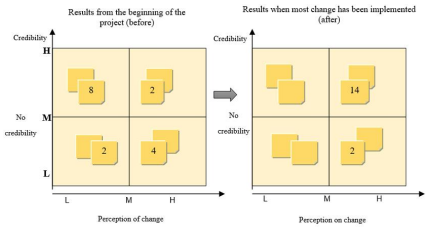

Fig. 11. Effectiveness matrix of communication in sub-project sP2 (numbers of post-it collected from workshops) Note: there are 16 impacted stakeholders/representatives (16 post-its) identified in the beginning of the project

(1) Extending applications to Knowledge Creation Process introduced by Nonaka and Takecuhi [31], to support implementing Socialization, Externalization, Combination and Internalization (SECI) model on process improvement cycle. The change management method must be valuable for organizations to create new knowledge by means of process improvement.

(2) Modelling the uncertainty of social behavior when reacting to change can be used to manage the uncertainty of staff behavior. Recently, some novel modes have been introduced by academic researchers. For example, the social resilience of communities and its model have been introduced by Santos et al. [32].

(3) Similar applications can be used in more cross-organizational improvement projects. Some methods or tools can be followed, such as CSFs in similar circumstances at the beginning; however, more standardized models and tools still need to be explored and defined for specific stages of change to help optimize any cross-organizational value chain improvement.

(4) According to some recent research focus on performance analysis by collecting staff data to analyze the work behavior of staff to probe optimal work strategies to effect change [33,34], one direction of our future work will be more in-depth theoretical research on between staff performance, and their behavior at work during changing process. Moreover, SECI process among the stakeholders could be used to identify the KPI, rather than developing them only on the output needed.

(5) Extending a more comprehensive research on the correlation between CSFs and performance. One direction could be using the statistical tool to prioritize the CSFs, like Multi Criteria Decision Making (MCDM).

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