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To propose common reconfigurable customer service platform for Fluido customers

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The concept of service platform is based on my personal experience while working with and helping manufacturing customers. The journey has been a great learning experience when working on thesis and doing research related to it.

I'm grateful to my professors for helping and guiding me through the Master's program. I would have been lost. This program has not only given me new skills, but also it help with their help and guidance. I want to thanks my mentor for Dr James Colin for the guidance on writing this thesis and also helping in understanding the details for doing research. Also thanking Sonja Holappa for all the help in writing clinics and reviewing my drafts at every stage.

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The thesis aims to propose a customer service platform for manufacturing customer which is reconfigurable. The proposed reconfigurable service platform aims to reduce the redundancy of efforts for Fluido resources in building or enhancing existing customers service platform. The changing way of manufacturing requires customers to make changes in their IT systems and adopt modern automation and intelligent systems which are reconfigurable. The proposal is build based on the data collected through interviews, workshops and meetings with service consultant and customers. A huge amount literature was referenced in the form of scholarly journals, publications and standard books.

The service design was proposed to management which covers all the weaknesses and strengths of the existing service platforms used by manufacturing customers. The validation was done from service leads about the design. The proposal also covers the implementation plan for the new reconfigurable service platform.

1 Introduction

The manufacturing industry is moving toward automations and digitalization, and this has caused process gaps in the service and maintenance sector of the manufacturing companies. The heavy machineries produced by the companies need timely servicing and maintenance, which means there is a need for tracking these servicing and repairing of the machines.

The companies need a platform or solution where they can track the machine usage and its performance. The process currently used by the manufacturers is old and outdated, and it is not synchronized or integrated with all the other internal systems.

Fluido Oy Finland based IT consulting company, which works on cloud-based application for its most of the Manufacturing customers for their digital transformation. Customers have a need for maintaining the equipment and customer service entitlements, their field service engineers need the details with which should be easy to access and up to date. Fluido has been able to help their customers to create a custom service platform where the customer can access the usage and performance of their installed equipment and service & repair needs as per the agreement contracts.

Currently, Fluido customers don't have the IT application or a common platform where the information can be easily accessible in customer service sector. The service process is segmented and distributed, the service agents have difficulty in gathering the information and supporting the end users. Fluido has been helping the companies in building or designing a common service platform where all the process and systems are integrated. The customer service platform is a centralized information center for support agents as well as the sales personnel Each company has their own support platform which might not be sufficient or capable enough to handle all kinds of requests. The common service platform can act a centralized resource to access data and streamline the process flows in the organization.

The consultants and business users working with different customers of Fluido are always facing the challenge in designing this common service platform or tool which would help the service sector of the companies. Most of the time the need for a common service platform by different manufacturing companies is the same at the core level of the service sector. Fluido designed tools or platforms for their customers are built on the same concept at core but later on get customized as per different customers. Fluido's manufacturing customers have a big customer service base which spans across different geographical locations and to different languages. The service platform is usually very large scale and complex depending on the company size.

1.1 Business Context

As an IT consulting firm Fluido Oy has been experimental in helping their customer implement solution for their service and maintenance. The manufacturing industry has been offering services with their products which have been built on automation and integration of the legacy application and Fluido has been helping them to get their information flow streamlined and shared on one common platform.

The manufacturers are getting benefits out of these as they have the requirement to make one common platform which interfaces all the other backend applications and collects the information from the machines. The information collected from the machines creates a roadmap for the manufacturers of the service and repair needs for their customer where the machines are installed.

Customers are contacted proactively with data collected, the field service engineer gets the historical information of the maintenance site and enables them to be prepared about the assigned service or repair task. The billing and quotation system are integrated which creates estimation of the budget which can be used by the customer for planning their finances for the coming year. The forecasting done by the system enables the customer to better plan their finances.

1.2 Business Challenge, Objective and Outcome

Fluido has delivered the common service platform to its customers, which has been designed and developed originally to cater the need of the specific customer. When a new customer approaches Fluido for a similar kind of implementation plan where they need a new customer service platform, the core functionalities of the customer service platform are mostly the same as what was offered to previous customers. The common platform for manufacturing customers helps reduce response time and increase the efficiency for the field engineer, as they can access the historical data through the platform Fluido offers them. The end customer can order and plan the servicing in advance which helps them plan their finances and renewals. This helps companies to gain loyalty of their end customers.

As a manufacturing customer, the data received by existing customer helps their research and development teams to work on a new age product which fulfills their customers' future needs. The customer service platform required by the producers is to check the uptime and downtime of their products. These customized cloud-based platforms can help the customer to maintain their product without getting any negative feedback from their users.

The problem is that the architect and developer at Fluido end up re-doing the same kind of work for every

customer. The common factors or parameters of the platform can be made reusable for consultants or business admin to give scope and estimation for add-on customization. Fluido can overcome the problem of re-doing or re-working on the same framework by building an reconfigurable customer service platform with core functionality of service sector of manufacturing customers. The platform should be reconfigurable so that later on customers can modify them as per their organization and product.

Objective

The objective of the study is to propose a common reconfigurable customer service 'platform' for Fluido customers.

Outcome

The outcome of the study is designing a reconfigurable Customer Service Platform which can be easily configured by the manufacturing customers.

1.3 Thesis Outline

This proposal for new customer service platform which is reconfigurable is done in 7 sections. Section 1 is about the introduction what is the study about. Section 2 deals with the the methodology and research used in this study, while Section 3 was conducted to do the Current State Analysis of the customer service platform currently being used by the manufacturing customer and reports on the results as for the strengths and weaknesses of the platform. Section 4 is about discussion and ideas from the literature and content available about best practice in customer service and knowledge needed to improve the customer service platforms. By combining different scholarly articles and literature an improved customer service platform can be build that was proposed in a conceptual framework. Section 5 is where the final building and designing of the customer service platform takes place keeping in mind the manufacturing customer needs from section 3. and Section 6 validates this service platform design. Finally, Section 7 conclusion and summary of the proposal for the customer service platform.

2 Method and Material

This section contains the research approach followed in the thesis and data collection methodology del and analysis methods used. In this thesis action research is used as a research approach because the study is conducted in the context of the organization, to propose reconfigurable service platform, and actions are done like clockwork, along with continuously researching design for platform. This section describes the research approach, data collection and analysis used in this study.

2.1 Research Approach

The thesis is based on the action research approach as the main research approach. It should be stressed that action research concerns actual, not abstract, practices. It involves learning about the real, material, concrete, particular practices of particular people in particular places (Bill, Stephen and Patricia 1998: 24).The research is about finding the issues in the current service platform of the customer and finding the common pain points in all service platforms and then proposing a common service platform addressing the needs of the Fluido customers. As it is useful think action research is a process which consist of at least two analytically distinct phases, the goal of the first phase is clarification of the initial research question and second goal is the initiation of the change or development process (Davydd 1999: 33).

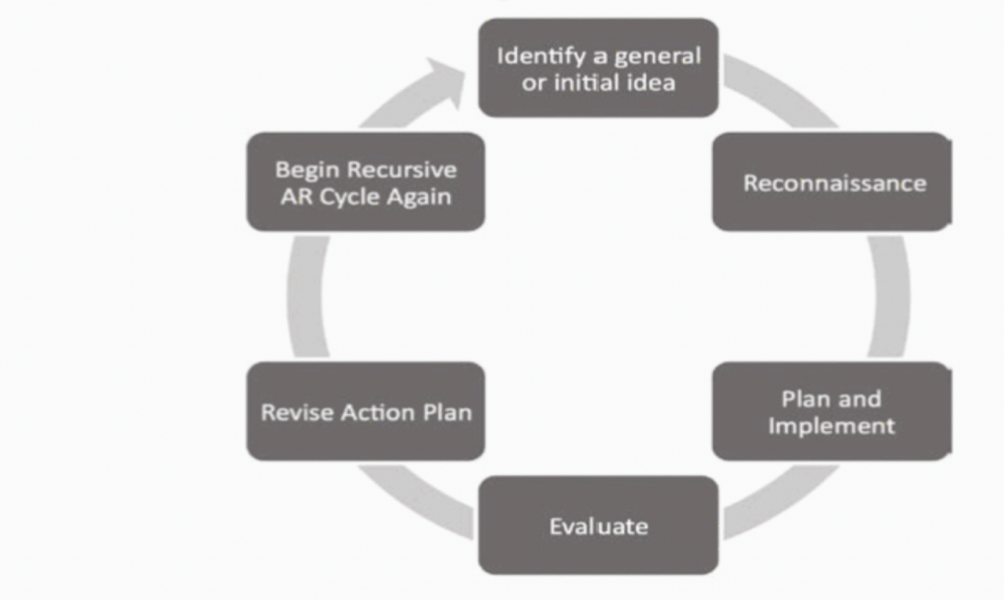

Fig.1 Action research as depicted by Kurt Lewin (Jerry Willis and Claudia Edwards 2014: 13)

A circle begins with the collaborative development of an idea or plan. Then it progresses through a series of stages that include studying the problem and solutions, creating and implementing an action plan for the particular context or setting, evaluating the results of implementing the plan, revising the action plan based on the results, and conducting another cycle of action research (Jerry Willis and Claudia Edwards 2014: 13). But in this thesis it is not going to be circular approach for re-defining the solution over the period of time, because of the time limitation for the thesis completion.

This thesis deals with the designing or proposing a common reconfigurable service platform which has all the necessary features of service platform and later on can be reconfigured by the customer based on their brand and products. This relies on the research done from different customer to collect the information of the usage of their current service platform, challenges faced and improvements they are looking for in their service platforms.

2.2 Research Design

The research design of the thesis identifies the information collection method and the sources involved . The data collection is linked to their respective proposed outcomes. The research helps to plan a layout for the required information from different sources and how that impacts the design of the service platform for each the customers. The research design for the thesis is shown in the below image:

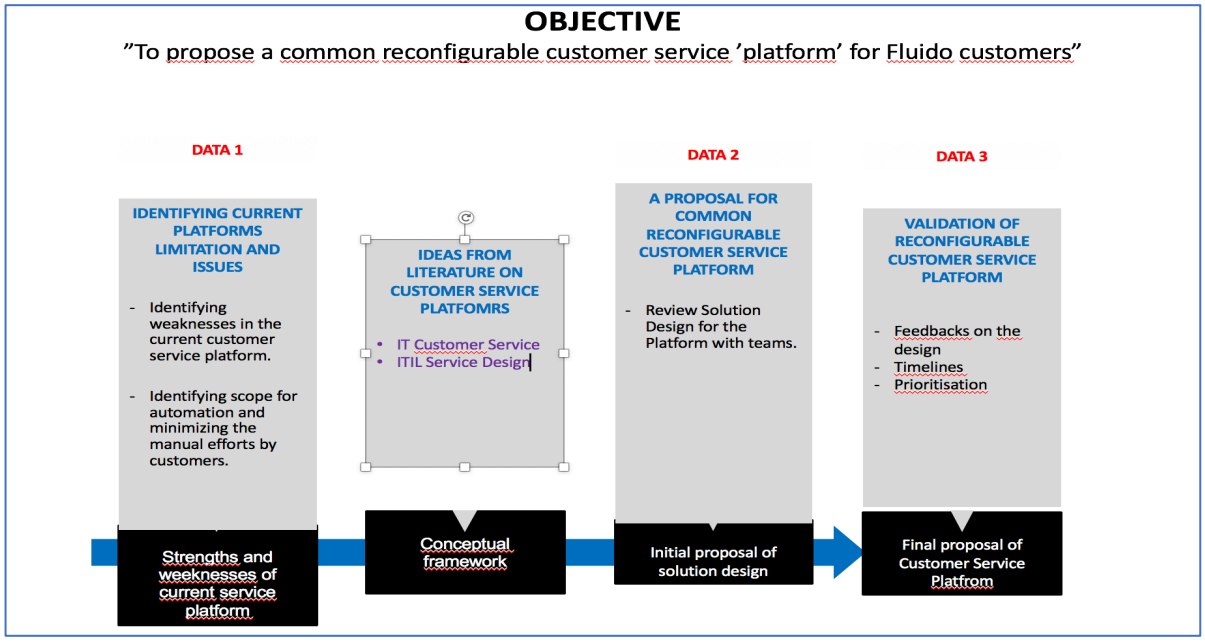

Fig 2. Research Design Approach

The first step is the current State Analysis which deals with the understanding of the current platform limitation and issues from the customers as well as the consultant dealing with those customers from Fluido. The data for current state analysis is collected through documents from the customer like incidents report and by conducting workshops. The customers current service platforms full information is gathered including issues and limitations, and also the scope for improvement in them.

The second step in the research design, Literature Review to get ideas on the service platform design, emphasis on finding common service platform based on the issues and challenges faced by customers. The literature referred to is mostly around IT service management , ITIL service design which can be referenced in proposing a common configurable service platform for the manufacturing customers service sector. The outcome in the literary review is a conceptual framework for the service platform design related ideas.

After the first and second steps i.e. current state analysis and the literature review, the next steps is creating a proposing solution for the service platform and design related suggestion for the service platform with improvements and core features of the current service platform. Including both the steps it lays the base for building of the proposal for common reconfigurable service platform. The validation of the proposal is to be done by the customers key users through surveys and workshops.

2.3 Data Collection and Analysis

The data plans is divided in three categories , Data 1 consists of the current state analysis of the current service platforms of the customers . Data 2 is creation of the proposal for the design of the reconfigurable service platform and Data 3 is for the validation or feedback of the proposal . The below figure present the data plan in the thesis.

DATA PLAN

	CONTENT	METHOD	INFORMANT	TIMING	DOCUMENTED AS
DATA 1 **For identifying current platforms limitations and issues**	- Identifying performance issues in current platform - Description of the current architecture - Identifying what needs and can be automated in the reconfigurable platform	- Incident reports from current systems. - Workshops with Fluido consultants and customers	- Fluido Consultants - Customers Key User	JANUARY-2020	- **Strengths & weaknesses of current platform** **- Customer specifications for reconfigurable platform**
DATA 2 **For proposing a solution**	- Review service Design with the IT team	- Weekly Workshops with Service owner - Review with customer Consultants	- Service Leads - Consultants	MARCH-2020	- **Initial proposal** for reconfigurable custemer service platform
DATA 3 **For validating the solution**	- Feedback on the design - Timelines - Prloritisation	- Design Surveys	- Service Leads - Fluido Consultants	MARCH-APRIL-2020	- **Final proposal for** a reconfigurable custemer service platform

Fig. 3- Data Plan in thesis

The data collected from Data 1 and Data 2 is about different people involved and the ways to gather the opinions. The Data1 was mostly collected through workshops with consultant and customers with help of questionnaire in a workshop and from incident or issues reported by the customers service agent over the period of time. Data 2 was about the design of the service platform with the service leads and owners who work with customers for their platform improvements. The collection of Data3 is done with series of online meeting with the service leads and collect their feedbacks on the design proposed for the architectural changes. The Data3 used in the validation of the design and adding changes to the design based on the suggestions. Section 6 are drafted based on the Data 3 and Data 2 is used in section 5 where the designing is being done based on the suggestion and workshops done with service consultants. Data 1 is mainly used in section 3 for current state analysis and section 4 where the an outcome is drafted based on the literature review and published research work .

3 Current State Analysis

This section analyzes what is the current state of the customer service platform is manufacturing customers of the Fluido. An introduction to the strengths and weaknesses of the existing service platform offered for manufacturing customers which includes drawing comparison between strengths and weakness of the platform. The data collection for current state analysis helps to identify the current issues with platform.

3.1 Overview of Current State Analysis

The manufacturing customer's service platforms are very critical for the business as the service provided to the customer helps in building the long term relation with customer and also the process of installation & maintenance of the equipment's are completed in time . The current state analysis of the customer service tools or platforms is done in the series of interviews and workshops which were done with Fluido consultants and customers. The consultants were chosen based on their work with customers related to service designs solution provided to customers and requirement gathering meeting done. The Fluido consultants who are experts in service design work with customers to identify the strengths and weakness of the current service platform in the initial project workshops where they try to understand the gaps and limitation of current platform. The workshops were held for the customers are to understand their current service tools architecture and pain point with the tool. The data collected is based on these interviews, workshop and requirement specification meetings with customers and consultants.

The main purpose of the current state analysis was to understand the current architecture of the customer service platform and the challenges which consultants face while providing similar kind of solution to different manufacturing customers. The consultants have to create template currently to show case the new proposed design of the service platform for every customer even though the design is similar. The current architecture of customer service platform describes the way process and information flow in the service tools executes, the customer keys user who are using the tool on a daily basis provides details about the process followed and steps taken to achieve meet targets , also they show the main pain point in usage. The customer keys users who are part of the workshops are experienced people who have been part of the organization since long time.

The consultants interviewed are having a deep understanding of the service sector, they have been working in service industries for a long time and understand the key factors which are critical to the customers. They help in guiding the customer in decision making process and helping them with tolls which measures the success rate. The questionnaire deals with queries related to the consultants working with requirements

specifications of the customer to give an estimate of the efforts that may go in the improvements.

The data collected helps in understanding the limitations and issues with the current service platform , the gaps in the process makes the planning and designing of the service platform. Some observations were also recorded which was taken as notes from the team meetings for the planning and service design of the tool. The observations were made from the internal team meeting which were related to customer service tools analysis and study for the improvement in process for the customer service agents.

3.2 Current state analysis of the current service tools used by customers

This section deals with description of different aspects which are analyzed for current state analysis of the service platform. For better service to the customer service agents of the manufacturing customers using the tool needs to be efficient and empowered to access critical information to share with end customers. The different roles which are participating in workshops held by consultants in workshops.

Table1 contains Roles and Responsibilities of the consultant and customers involved in workshop

Service Consultants	The service consultants from Fluido are responsible for customers workshops and understanding customer service applications, and issues related to these service platforms.
Solution Manager	The solution manager is usually the customer side face who is responsible for the driving the business requirements with IT vendors. The solution manager makes sure that all the business problems are addressed in the solution and approving the solution with business and stakeholders before implementations.

Key User	The key users are supervisors or team leads of the frontline service agents who managing a set of different teams across different geographical locations. They identify and report the issues related to service platform to solution managers.
Release Manager	The release manager is the person who is responsible for the deployment of the solution across the different teams and the process are followed in deployment . The role out happening should be done with help of Key Users.

3.2.1 Different Communication Channels – Table 1

The end customers of the manufacturing companies have feasibility of contacting the manufacturers through different channels phone, email or online forms. The service tools managing the different communication channels are different which are internally integrated so that they can record contact point by each of the customers. The agents working on each of these tools have to follow different process to work on request. The request or enquiries recorded on the different channels are maintained in separate tools which causes issues when reporting or checking the performance of agent as the supervisors have to execute reports in using different tools to calibrate the result of the productivity.

The complexity of the service platform increases when more systems are integrated in order to access more information needed to help the customers. Uniformity of the information is also a big challenge, when same customer is being served from three different channels and by different agents. The collaboration among the agent causes issues, when there are multiple requests or enquiries raised by the customer through different channels.

3.2.2 Multiple Source of Information

Currently when agents are not able to resolve the issue from the first contact, they would need to request or access different tools to get more details of the equipment, invoice or sales related details from sales or marketing tool. As more tools are needed the dependency increases for the right source of information, as the number of tools increases and the integration is needed for accessing critical customer data this leads to performance issues which causes delay in resolving customer requests. The sales tool or marketing tool is hosted on the different platform for different set of users which is controlled and by different teams. In order to access the required information the agent needs approval from the supervisors or admins to get the data and help the customer. The delay in accessing the information causes slowness in maintenance and installation process which impacts the manufacturers business.

3.2.3 Lack of 360° degree view

The distributed tools and application lack a complete 360° view to the agents working closely with customer. The turnaround time for the agent increases with such inter-dependent systems which are not showing complete history or summary of the customer account to the agents. The details of the customer's account who is using the equipment can help the agent understand the usage and current expectation of the customers. This could turn into an good sales opportunity also. So, a complete 360° view platform helps not the service process but also the sales process. Most of the manufacturing customer lacks this feature in their existing service platform as per the data collected form workshops and the interviews conducted from the consultants working with the customer. In the customer workshops and requirement analysis done for the improvement of the current service platform , lack of 360° view was the primary feature pointed out by the majority of the manufacturing customers. The 360° degree helps the service agent to access the historical data which they can use to set the right expectation with the end users.

3.2.4 Lack of Automations

Current service platform has limited scope of automation, automation could have enabled customers service agents to work more efficiently. The manual work in fetching information through different system slows down the turn-around time for the service agent to get back to the end users, the service contracts get impacted for the installation and maintenance related equipment of the manufacturers products. The automation scope is limited may be because the technical limitation of the current platform, as the platform is not scalable to the high-volume data inflow. In the interviews, the consultants also pointed out the issues

with the amount of manual steps taken by each is agent working with customer request takes a lot of time and increases the frustration of the end users. This also creates bigger financial impacts to the manufacturers. Current service platform most of the approval and request flows through email and pdf attachments, which are not stored I not system which results in lack of proper file management system or approval process. The reporting and analytics is challenging on such service platforms where the system is dependent on email for storing critical customer informations.

The lack of automation is a big weakness in the current service platform, which has been highlighted in customer workshops, interview with consultants working with manufacturing customers of Fluido as well as in the team meeting where customer requirements analysis is being done.

3.3 Understanding the architecture of the customer service platform

The current service platform of customer has different incoming channels for capturing customer service requests. Customer can contact the support team of the manufacturers through different mediums possible such as email, phone or online chat. Support centers use different tools to capture these incoming requests which are handled by the different set of the support agents as Fig.4 shown below.

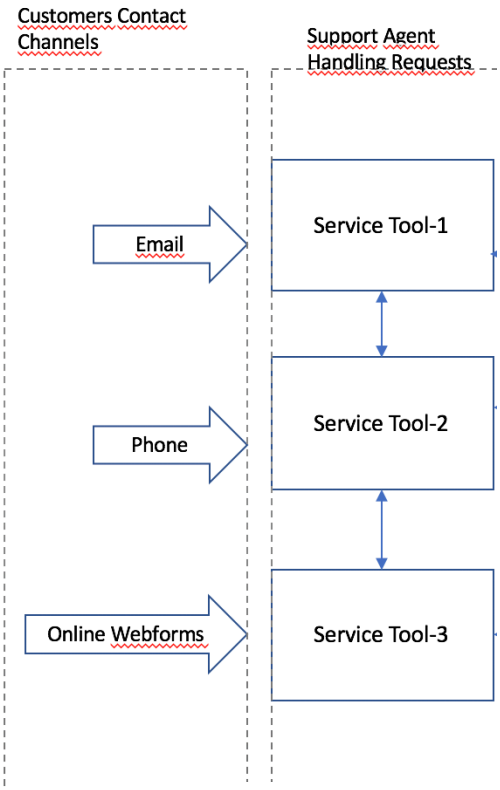

Fig. 4

Different set of service tools are used by the different agents working on different communication channels. The service tools are not integrated between each other most of the time resulting in duplication of efforts for same customer but on different service tools and by different sets of support agents. The multiple channels of communication with customers done by support agents are mostly not unified i.e. communication is not standardized, and the quality may not be up to the standards.

The email channels are mostly a service request set up for the customer where an incoming email is logged as a customer case in the tools. In email scenario all the contacting with customers is made through emails and using predefined templates. The entitlement process and SLA are calculated based on the emails during a defined interval of time

The second service tool is related to any kind of customer interaction happening through phone to the support agents. The support agent manually takes calls and registers each interaction with customer from phone in the service tool. The service tools handling phone requests has limited automation which can help service agents to resolve or answer the queries in a defined time frame as per entitlements or SLA's for them.

The telephonic conversation is recorded and stored in tools for quality check and training purpose. The supervisors and agents need to link the records with each customer which might be existing customer or a potential customer. Customer phone records are maintained and contact information are mapped with them , so the reporting can be done based on the incoming phone calls for customers.

The third kind of service tool which most for the manufactures use in their support center is web chat or online webform. Online chat form are being use to interact with end customers by manufacturers to register

the request or issues. The agent has to be online to for incoming chat request from the customers , to manage the agents bandwidth for taking simultaneous chats are mostly done by supervisors manually. Chat records needed to be stored in the tools for associated them with existing customer contact record if already existing or new potential customer.

For every service request, customer contact agents may be not able to resolve the issue by the information available to them. They may have to reach out to different teams to get the right information which can be shared with customers. Typical scenario where agent needs information which may not existing with support agent, then the service request resolution time for customer is longer than usual. This causes bad customer service to the customer and also impacts the agents KPI.

The service tools depend on other processes and tools to answer or resolve customers issues registered through different channels. The lack of automations or integration causes a great amount of manual efforts for information flow to happen between tools. Agents are responsible for the information flow happening across different teams.

Figure 5 depicts the current customer service platform architecture, with bi-directional data flow from agent to other teams and vice-versa.

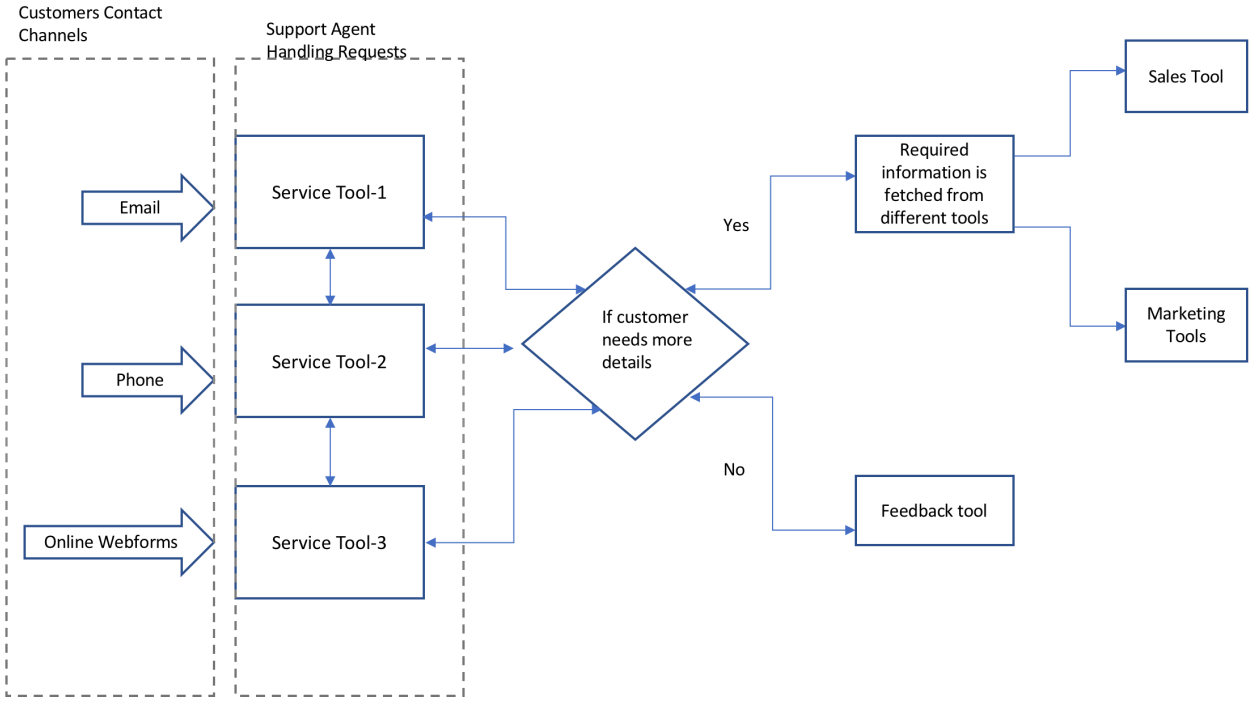

Fig.5 : Customer Service Platform

As per Fig. 5, the service platforms usually have three communication open to end customers. The communication channels are email, phone and online webforms. Each communication channel is controlled by three distinct service tools by different set of support agent teams. The agents are part frontline support teams, they have responsibility of answering the queries and closing the service requests. For any additional information needed or approval for new order or quotation, agents reach out to next level or other teams. Different teams have their separate tools and flow of information is usually manual to the frontline agents. So every customer request has to go through different tools which are not automated to integrated, which causes time related issues , security of sensitive information is at risk and agent don't have any proper visibility of the status pending with others teams.

3.4 Strengths of current service tools used by customers

As per the current customer service platforms the analysis for strong points on the architecture of the service tools is part of current state analysis. The requirement gathering exercise with customer helped in capturing the strengths of the current service tools and service platform.

3.4.1 No Single point of failure

As the service platform is depending on different service tools to handle the incoming volume of the customer request, there is no single point of failure if the primary communication channel is facing outage . The other service communication channels are responsible for business continuity in service platform. Issue with single point of contact in service platform is failure in tools, which brings down the entire service platform and customers lose trust in the manufacturer because of poor service. Technical issues can be the cause of service interruptions, but these outages should not be the reason for poor customer service experience.

3.4.2 Distributed Access Control

Each tool is maintained and used by a different set of service agent and teams, the access and security control is maintained by different teams which are monitoring and maintaining the service tools on the platform. The distributed access control is advantageous because the user provisioning process is becoming simpler for any new agent who needs access to any specific tool. Record sharing across different tools are also controlled by team admins of each tool. Privacy of the information is maintained in different team and are shared only with proper level of approvals from the supervisors or the team admins.

3.4.3 Controlled Data Flow

Sensitive information is controlled from tool to tool by different teams, approval process is in place when information needs to be passed or accessed from different tools. The admins or supervisor of each tool are making sure sensitive information is shared across or shared with end customer. The whole approval process is manual and time taking, which sometimes results in slow response time for agents. Data is sensitive and without proper supervision may result in legal issues with end users. This means the proper level of scrutiny is mandatory by the admins of each tools.

Customer service platform weakness is being highlighted in next section.

3.5 Weaknesses of current service tools used by customers

This section highlights weakness in current customer service platforms of the manufacturing customer after interviews and workshops with customers and Fluido consultants. Few of the current weak points are discussed in the below section which are most common in different customer service platform and there is scope of improvement with regards to these weaknesses. Increasing popularity of the IT technologies, the quality of service delivered to customers with improved IT service platforms leads to reliable and stable customer service.

The main weakness or scope of improvements on the existing customer service platforms are:

3.5.1 Too many tools and process involved to access data

To complete a service request raised by an end user at least, four to five tools are needed to, and the user related sensitive information is flowing across different tools. There are too many tools involved which causes delay in response time for the agents, also impacts the customer service experience. Complexity of the service platform is high, which causes issues in maintenance and is costly for the IT teams to continue its stability. Tools are old which have limitations that doesn't support the volume of incoming requests during peak business hours. The system delays may cause in some data corruptions, which is big issue when information shared with end users is not corrector missing details. Reliability is another concern which arises due to delays or corruption the agents have to manually check the sanctity of the information from different teams before sharing it with end users.

3.5.2 Lack of Automations

Service agents are the ones doing most of the heavy lifting in the current service architecture because of all the manual actions and efforts taken by them in ensuring the correct flow of information between end users and the teams corresponding to their queries. The service tools are not automated as this was raised by several manufacturers in requirement gathering workshops with consultants. In today's age of artificial intelligence and robotics manufacturers are using legacy systems which are on-premise with limited scope of automations. IT system have made progress by using cloud based CRM system which are automated and use AI for handling customer query which reduce the cost of maintaining service centers and deliver good customer service experience. As Fluido consultants pointed out these weakness to in the current state analysis of the manufacturing customer's service platform architecture .
Most of the Fluido's manufacturing customer's have pointed this weakness in their current service platform. In order to do so they wanted to re-structure their current on-premise architecture further and move their IT system to cloud based platforms.

The manufacturers main aspect is to expand and improve of their service offerings, especially in their customer services, customer service is largely seen as the interface between the production and the use of the products (LaLonde, 1976; Czepiel, 1980; Peel, 1987; Sterling and Lambert, 1989; Bolumole, Knemeyer, and Lambert, 2006; Harris, 2007). The manufacturers own customer service organizations is not the only ones acting in the chain of service, but also the outsourced small and medium size organizations which trade and repair businesses, those organizations which carry out inspections, maintenance and physical installation work needed within the product's life cycle (Willerding, 1987).

Through the integrated automated service platforms design for a new product, customer service requirements for the customer technical support related start-ups, maintenance and repair of machines and plants can be guaranteed and the efficiency of customer service platform increased. By coupling product development, documentation, customer service, consulting and modern information technology at an early stage of designing, when product service systems are created, as this describes life cycle of integrated process-oriented product and service information at the manufacturers with justifiable expenses and effort.

3.5.3 Slowness in process flow impact service agreements

The overall flow of information from end to end is slow with service platform where so many tools are being

involved in gathering correct data to be shared with customer with manual efforts. Delay related to service request cause huge impacts in daily work of a field service engineer as they need to generate quotation for the repair or installation work. The maintenance contracts signed between consumers and producers are largely depended on service level agreements which has to be done timely otherwise the machines are damaged heavily or the customer can lose their business. The service level agreements violation may lead to an legal conflicts between consumer and producers, so slowness of service is business critical for a service platform which is major feature or enhancement request from the Fluido manufacturing customers.

3.5.4 Lot of Manual Process

Understanding expectation of customers which can be related to process of installation, maintenance or repair and taking measures to satisfy those expectations. The manual process consist of service model , performance of the service tools and following the guidelines. As per (Wells, 1998) the key elements which can provide the necessary steps for its customer service , business processes, and information systems to improve the organization value and visons. The key elements are:

(1) business process analysis,
(2) integration and redesign of customer data,
(3) IT-enabled customer interaction
(4) Accessibility/transmission of organizational information.

The manual processes includes approval management from the team or supervisors. Access related to sensitive information of the customer data, which comes data protection acts of the state. Each time customer request or reaches out to service agents for ay specific queries they have to go through the process or different levels of service team to get the right information. Turnaround time or resolution time for any issue is higher usually and this is also disadvantageous to the KPI of the service agents.

3.6 Summary of current platform strengths & weaknesses

The current service platform has been facing challenges related to increased productivity of the service agents working on the tools, maintain trust with customers, technically challenged with new system and IT technologies. Each of the weakness of the service platform found in workshops and interviews has been the common across different manufacturing customers of Fluido. So this projects a bigger challenge for the Fluido as they need to develop or revamp the whole service platform and move from on-premise to cloud based. This redesigning of the service platform has become recursive task for the Fluido as they have to repeat same process or development methodologies for each and every customer. So, there is need of a reconfigurable platform which can be deployed to each customer so that customer can reuse them with provided features and brand them and enhance the tool as per their needs.

Strengths of the current platform can be made part of the new design in reconfigurable platform , as these are main and important features which can help to maintain the security and access setting in the platform across different teams. The interviews and workshops have highlighted few common weakness which are to be considered in new design of the platform . As per the analysis the issues highlighted and scope to work on is shown below figure:

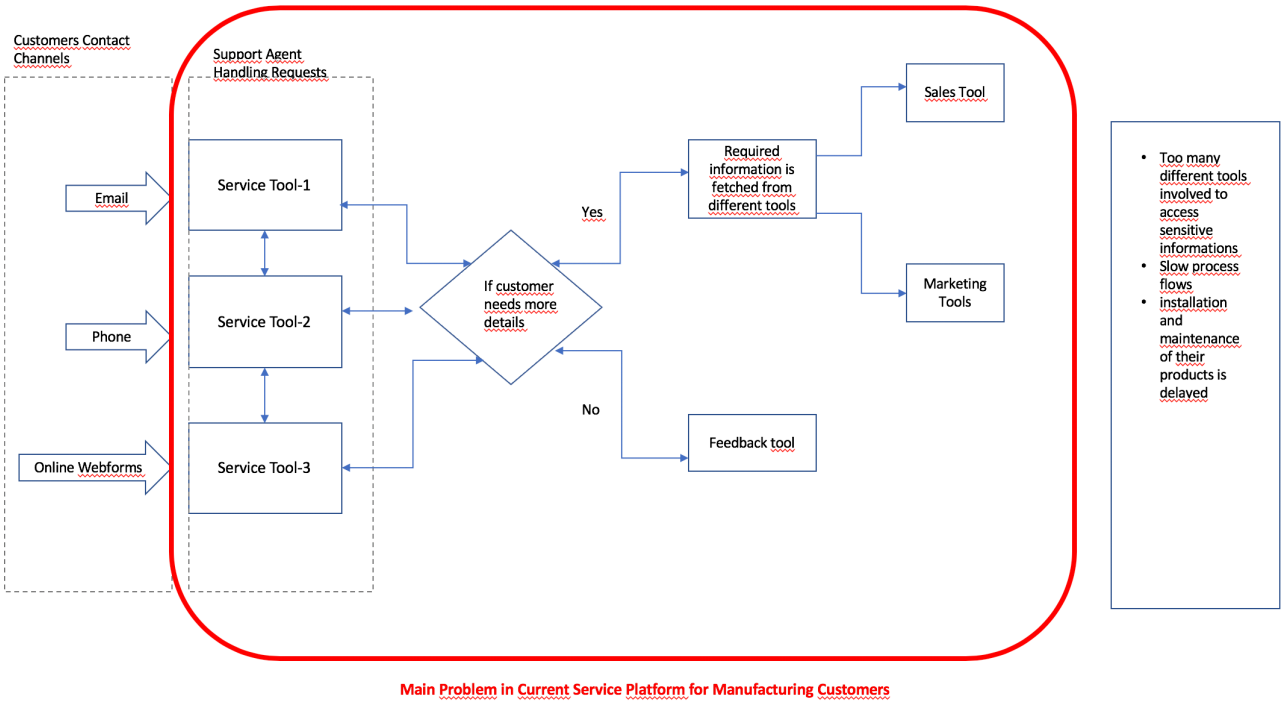

Fig.6

Therefore, as per the current industry standards and requirements, Fluido's manufacturing customers need a service platform which is capable of delivering all the above discussed features for building service oriented manufacturing mode termed as Cloud Manufacturing as per "*Prof. Bohu Li, an academician of Chinese Academy of Engineering*".

4 Best Practice for Customer Service Platform

This section discusses best practices in literature to help find solutions for the weaknesses identified in the current state analysis. The literature research is around the guidelines for building a customer service platform which meets the needs of customer in changing landscape of IT systems. The first part is the requirement gathering for the service platform, which includes identifying the core features of a service platform which is needed by the manufacturing customers. Secondly best practices are investigated in ITIL framework for a systematic approach in IT resource management in an organization, technological changes, cost reduction, maintenance, decision making process to improve the current organization strategies. Third topic is about best practices in IT industry regarding automation which covers incident management, service requests and asset management (Sterling, J. U. and Lambert;1989). Customer service research. Managing multiple customers on single service platform which can also support legacy tools which are still being used.

4.1 Identifying core platform features of a Service Platform used by Manufacturing Customers

In order to overcome the key issues faced by small, medium sized enterprises (SMEs) and large enterprises, existing tools and limitations of the tools were analyzed by Sawy, O. A. E. and Bowles, G. (2003). There is a big need using new emerging technologies in a service platform to keep up with customer demands and competition in market (e.g., cloud computing, internet of things, service-oriented technology). The concept of manufacturing resource and multi-tenant sharing architecture based on cloud computing for enterprises is discussed in many literatures and manufacturing based cloud computing solution for service platform i.e. cloud manufacturing is introduced (Huang; 2013). The architecture of cloud manufacturing was proposed, and the key technologies implementing core features of cloud manufacturing are introduced in detail. The factors affecting implementation of cloud manufacturing service platform for enterprises are discussed in detail.

After decades of development, chain production in manufacturing has made changes in the fields of resource service modeling and encapsulation, in allocating resource and scheduling, cooperative process, workflow

management, etc. However, if there is a need for achieving better results in terms of economic benefit, existing technologies and different modes of operations, which have led to some bottleneck problems: (1) there are problems in the service platforms, which include lack of centralized management and operation, unequal profit distribution mechanism, incompetency to guarantee service efficiency, quality, and promptness; (2) technical issues about manufacturer facing with product distribution and sharing; and (3) safety and security issues (Huang; 2013).

With new age technologies in IT systems, one of the key area of focus of manufacturing customers is to move their service platform from on-premise to cloud. Cloud computing is solving the reducing the cost of infrastructure maintenance and increases the accessibility of the resources. The concept cloud computing is about virtualizing the service and then storing it in the cloud which could be easily accessed by the requestors. The cloud is a platform as a service, which is mainly provided by big cloud based organization such as Google, Amazon, Oracle, Microsoft, Salesforce etc. as they are the ones responsible for the storage and computation. Technically, cloud computing is a more enhanced form of system virtualization and grid computing, and yet it is revolutionizing the software as a service form of cloud computing which is of more significance. Figure 7 shows the running principle of a manufacturing cloud.

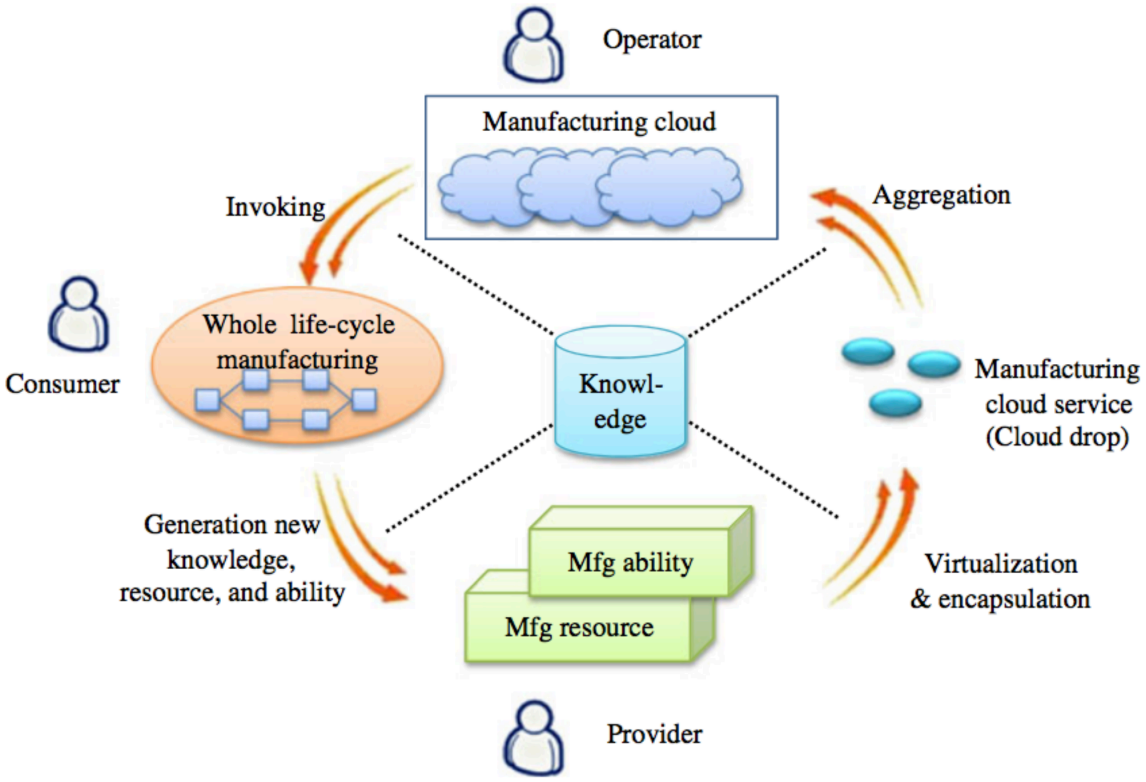

Fig.7 Cloud Computing for Manufacturers *(Source: The International Journal of Advanced Manufacturing Technology)*

The Manufacturing clouds services are defined collection of specific rules and algorithms, and therefore different kinds of manufacturing clouds are developed. Different manufacturing customers can search and invoke the qualified manufacturing cloud services from related manufacturing cloud according to their needs. As illustrated in Fig. 7, there are mainly three category users in a manufacturing cloud: they are (1) the provider—the providers own and provide the manufacturing resources and abilities; (2) the operator—the operators operate the manufacturing cloud platform to deliver services and functions to providers, consumers, and third parties; and (3) the consumer—the consumers are the subscribers of the manufacturing cloud services available in a manufacturing cloud service platform (Huang; 2013).

In the last few decades, manufacturing industries have shifted to more computer integrated manufacturing approach based on new researched and developed manufacturing modes and new technologies in IT. The advanced IT systems have given birth to different kind of manufacturing approach based on which the foundation was lay down for a cloud based service platform for the manufacturing customers. The different kind of computer-based manufacturing techniques which merged in the last few decades are (Huang; 2013):

- Computer Integrated Manufacturing (CIM)

- Agile Manufacturing (AM)
- Concurrent Engineering (CE)
- Networked Manufacturing (NM)
- Application Service Provider (ASP)
- Virtual Manufacturing (VM)
- Global Manufacturing (GM)
- Dynamic Alliance (DA)
- Industry Product-Service System (IPS2)
- Manufacturing Grid (MGrid)

The cloud-based customer platforms have emerged and have been adopted across all service based industry and are being used heavily in manufacturing industry. Some of the biggest software giants are already the largest cloud service provider like Amazon, Google, IBM and VMWare. These enterprises have invested heavily on both fronts in human resources and technological resources, to create secure and stable cloud-based infrastructure which can be used and adopted by different industries like health, financial, education etc. (IT Service Management Best Practices Using IBM SmartCloud)

Current manufacturing customer lacks an open architecture so it is hard to integrate them to new tools or services, there is no standard guidelines setup, and also the specification missing , lack of intelligent service tools which can be embedded to physical manufacturing tools which can monitor the health of the running devices and tools. The lack of intelligent application is causing issues in the manufacturing process.

There is deficiency in innovation and design related capability: The innovation capability of a large manufacturing enterprise is mostly dependent on “knowledge and capability” and to control the market and financial aspects (John D. Wells*, William L. Fuerst, Joobin Choobineh;1998). Also, the training and empowering of the technician’s and service agents which are interacting with customers in service sectors is an important development plan for the companies. Any deficiency in capital and research department will hamper the technological growth of the manufacturing companies.

The existing resources have lot limitation in regards to integrations and with low efficiency of manufacturing of products: For majority of manufacturing industries, the integration of systems is not only limited to products, but is also based on manufacturing process which includes technique related to standards, designing blueprints, and meeting the requirements, all of these are more significant in nature. Involving external resource or cooperation is always more expensive to the manufacturers which is a major issue for

the cooperation. As it takes some time to establish trust and mutual understanding between both entities, so it is important to find an organization not only with resources, but which is able to embrace these qualities easily. The lack of understanding the manufacturers work environment and technical standards followed by them in manufacturing causes delays in finding the ideal partner with resources. The process of building a new relationship with partners in a manufacturing process is long and expensive so the companies are hesitant every time there is the need to introduce new technologies or the partner which can implement new technologies, because the process is costly and time taking. (Huang; 2013)

Lack of credibility in manufactured product transaction and financial evaluating systems: The majority of manufacturers are dependent on a network of customer service platforms to introduce their products to the consumer market. The challenges are how to do market research to match the needs of the consumer and to take out the resource to appropriate market. Thus, the lack of proper evaluation systems in transaction related to resources is responsible for the above-mentioned problems. Manufacturers have methods for evaluating if a product is old and primeval which can be used to evaluate market credit for the resources. The lack of manufacturing technology and old equipment are the main cause for a decrease in production, lack of core production, over dependence on old production methods, lack of latest products, high level of low-level production, and unnecessary additional cost added to productions. (Huang; 2013)

The analysis and the demand in manufacturing customer could be achieved through cloud computing, which provides a new paradigm and scope of improvement in the existing problems in industry. Security and privacy in Cloud computing is a key feature and when combined with other aspects of cloud computing like shared resources and accessibility provides a better option commercially to manufacturers. The advancement in embedded systems has opened doors to integrate the physical system with the cloud which provides industries better control and monitoring capabilities. (Huang; 2013)

IoT has seen a rapid growth with the advancement in chip technology, artificial intelligence, and nanotechnology. This has lead to an interconnected network of physical devices which are performing tasks without taking any manual instruction in service platforms (Haines, R. W. ;2006). Therefore, the usage of internet of things will contribute in building a service platform where resources are shared and connected. Customers receive health reports of the running equipment in their integrated service tools, they are proactive in maintenance and repair process of the heavy machineries rather than being of reactive approach to manufacturers. The installation and maintenance of the systems become easy with application developed using the high-performance computing system. This could be implemented on a large scale in different manufacturing plants and controlling IoT devices through centralized systems. (Huang; 2013)

4.2 Identify the scope of automations

Building a service platform keeping in mind the current setup and requirements of the service platform, the automation scope can be done at different level in platform like manufacturing level, business process, service level, knowledge level, transaction level and user level. In this section, discussion is around the need of automation and impact it has on different levels in manufacturing industry.

We are moving towards 4th industrial revolution which is responsible for transformation of the manufacturing sector. Advancement in manufacturing—in the form of new manufacturing techniques, renewable materials, automated machines, and smart platforms—is moving towards a new age of physical production. The IT systems are changing with adoption of intelligent systems which have increased connectivity and complex systems responsible for data-gathering and analytics capabilities enabled by the Internet of Things (IoT) have made customer service platform intelligent with minimum manual intervention there is a shift toward an information-based economy. With the artificial intelligent and IoT, data is controlling the physical objects, and connectivity makes it possible to build smarter supply chains, manufacturing processes, and even end-to end ecosystems. (Source: Deloitte analysis)

As per the Deloitte consulting , (Brenna,Monika and Mark):

While Deloitte refers to smart, connected manufacturing as Industry 4.0, several other commonly known terms may point to the same phenomenon. These include:

- Industrial Internet
- Connected Enterprise
- SMART Manufacturing
- Smart Factory
- Manufacturing 4.0
- Internet of Everything
- Internet of Things for Manufacturing

As per the figures 8 shows, the evolution of the industrial revolution through the centuries.

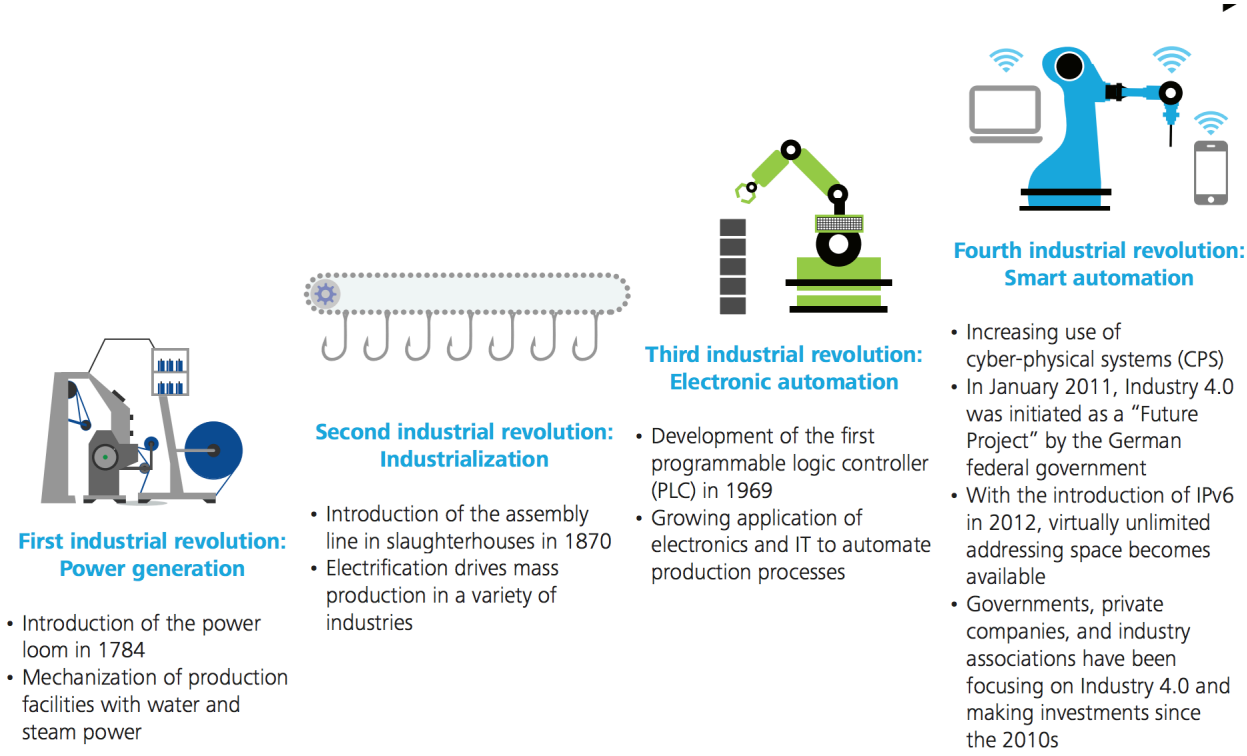

Fig.8 A history of industrial revolutions: Industry evolution with key developments

The Figure 8, shows in 20th century the industrial revolution is about automation and intelligence. The systems are getting intelligent and automated with less and less human intervention day to day operation of the manufacturing industries. All government are moving to digital mediums for providing services to the people and private companies are adopting intelligent systems.

Manufacturing have understood the importance of control systems in the factory and manufacturing plants which are referred to as operations technologies (OT).The general function and customer service capability that synchronizes across functional systems is referred as information technologies (IT). Both are going through significant changes in ways that is providing new opportunities and changing the way of doing business. Manufacturing industries are understanding how information technologies are controlling the physical world automation and intelligence. (Source: Deloitte analysis,2016)

Inherent within manufacturing industry stands for creation of information, systems communication and tasks performed based on information. The input from information is used in manufacturing of physical object in following: product designs are created by drawing in design software or scanning physical objects. The data is fed to the machines which are producing the physical object based on the designs. Usually, information

from the process of creation (and subsequent use) is further captured, sparking ongoing cycles between the digital and physical realms. This is where the overlap between the concepts of Industry 4.0 and the IoT becomes apparent. As IoT is crucial, perhaps the most important element of Industrial revolution 4.0. The concept of IoT and artificial intelligence has gained lot of attention and adoption in recent years by the manufacturing industry. As it is important for connectivity that both products and services are leading to satisfaction among customers and clients (Timm, P. R ; 2005).. Currently, a hub of connected information technology is advancing rapidly, including high quality sensors, better reliable tools and powerful network of integrated systems, high-performance computing (HPC), robotics, artificial intelligence and cognitive technologies, and augmented reality. Together, all these technologies are changing the manufacturing industry in profound ways. The analysis for flows of information is positive growth towards a framework that captures the series of action and sequence of activities by which organizations can create value from information: *the IoT Information Value Loop* (Deloitte Research Paper) shown in Figure 9.

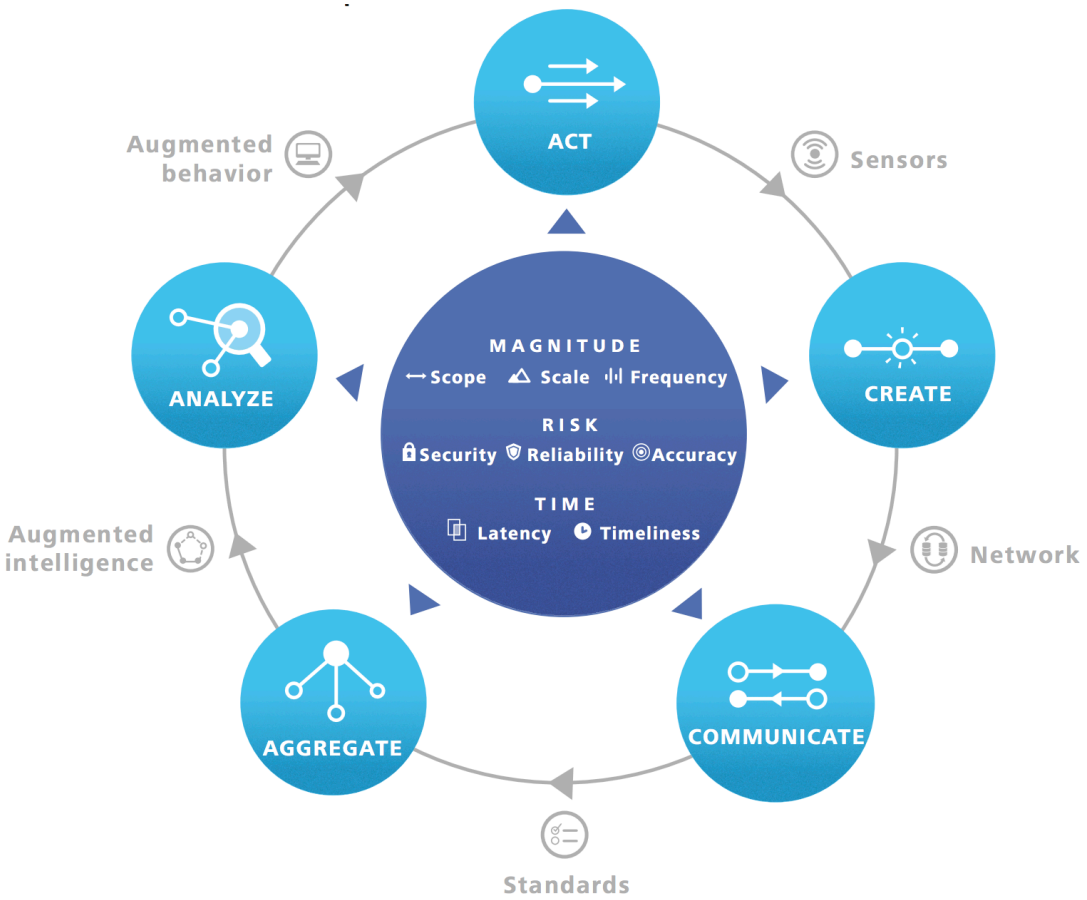

Fig.9 The Information Value Loop(*Source: Deloitte Research paper*)

Figure 9 depicts, the collection of series of information which has been gathered by organization from different actions and process. The whole cycle of the information flow is creating value for the organization.

The physical-to-digital and digital-to-physical transformation are unique to manufacturing processes (figure 10). It is the process where the manufacturing process is connected by digital technologies which are moving from digital back to physical and physical to digital that constitutes the essence of the Industry 4.0 concept.

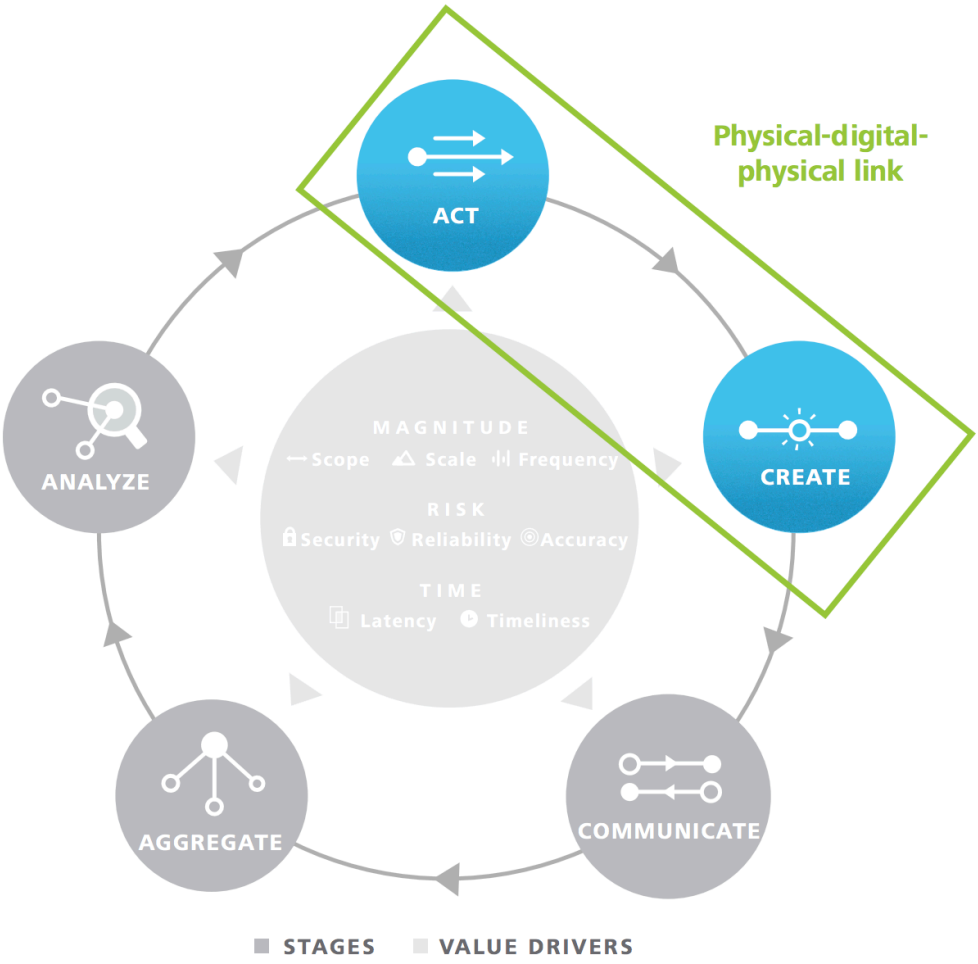

Fig. 10 The physical to digital to physical of Industry 4.0(*Source: Deloitte Research Paper*)

The figure 10 shows, our focus of study here is customer service platform which has features of industry 4.0. An integration of the systems and relevant physical technologies, including analytics, additive manufacturing, robotics, HPC, artificial intelligence and cognitive technologies, advanced materials, and augmented reality, that complete the physical-to-digital-to-physical cycle. (Deloitte Research Paper; Sniderman, Mahto, Cotteleer;2016).

"John Deere uses augmented reality to allow customers to test and provide feedback on early design concepts, so that it can adjust and redevelop designs. "

4.3 Need of Integration with legacy system

The legacy system and tools which are involved in customer service process need to be integrated with each other , so that the agents don't have to work in silos mode (Muhamet Gërvalla, Naim Preniqi , Peter Kopacek). Current tools and systems needs to be integrated with each other and with the proposed cloud solution for manufacturing industry (Case study: Rockwell Automation controls Ridgeline Pipe Manufacturing;2015). The manufacturing cloud with industrial revolution 4.0 has the flow of information from different system. The manufacturing layer which deals with physical objects in industry, User layer, transaction layer, business model ,service model layer and platform service component are part of the digital technologies in the manufacturing cloud (Fig.11).

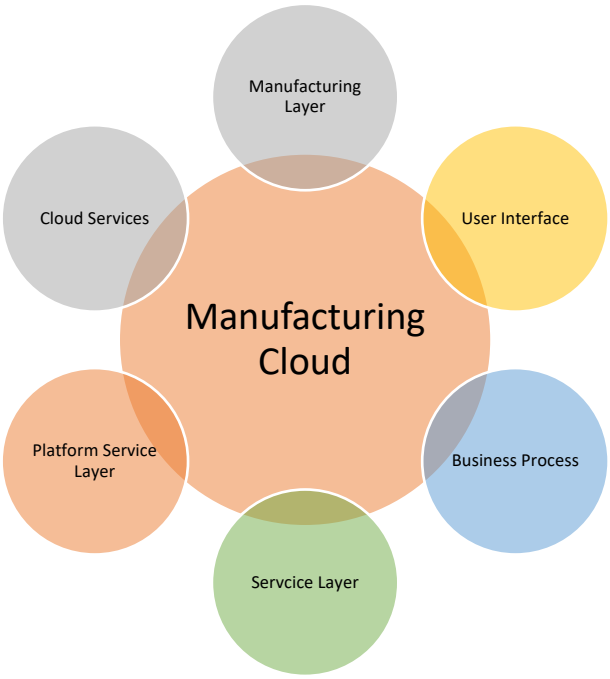

Fig. 11- Manufacturing Cloud Integrated Services

The manufacturing cloud architecture is been described by Huang, Chenghai ,Chao, Zhao;2012 which covers traditional product-oriented type to service-oriented type. The architecture they proposed was based on 12 layers which includes (Fig.12):

- Manufacturing resource layer
- Basic supporting layer
- Persistent service layer
- Engine layer
- Tool layer
- Service component layer
- Service module layer
- Business model layer
- Transaction layer
- ESB layer
- User layer

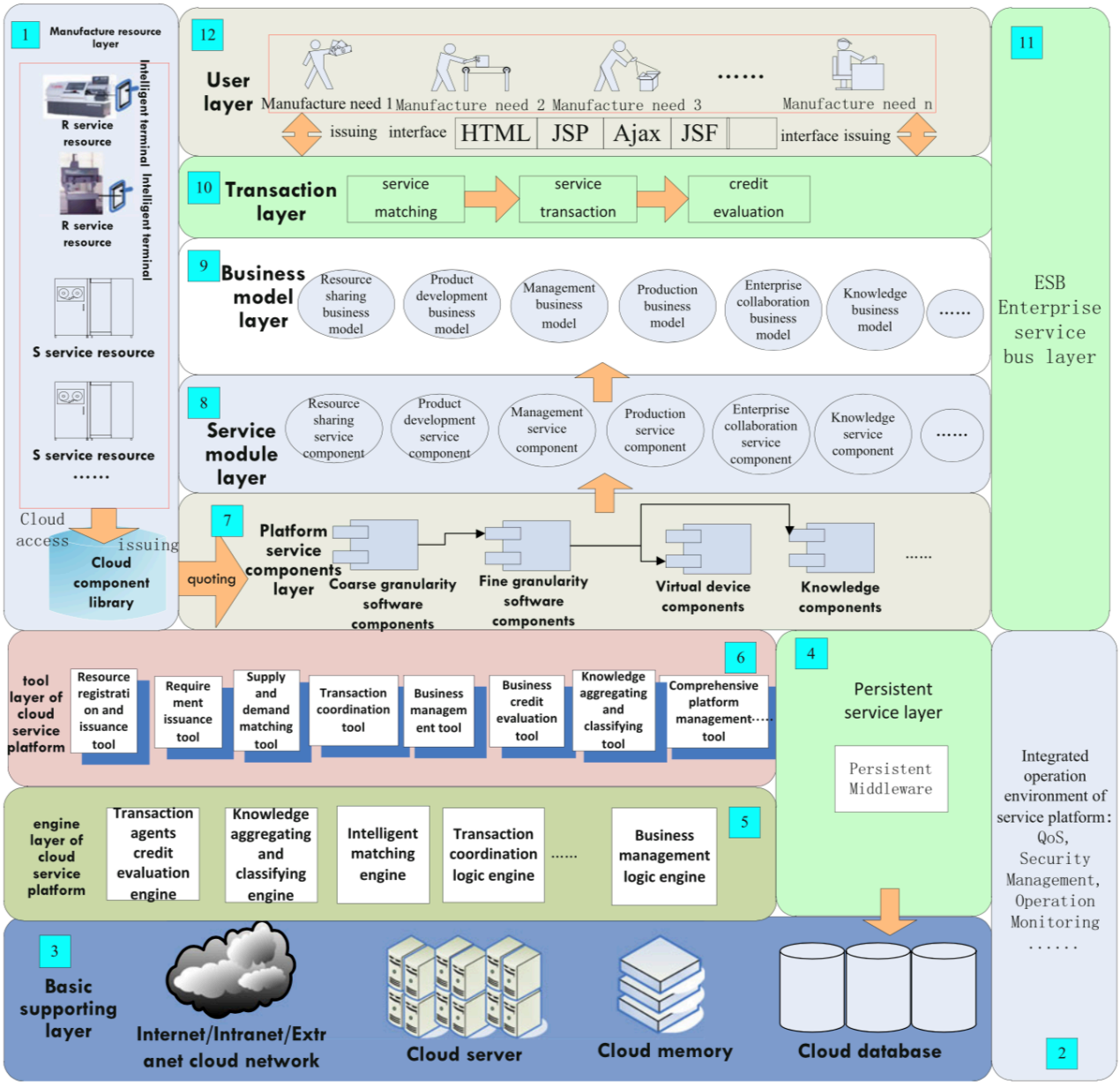

Fig.12- Architecture of Cloud Manufacturing Cloud (*Source: The International Journal of Advanced Manufacturing Technology*)

The integration of different layers in manufacturing industry makes the automation more suitable and easy for the process flow. The cloud based service platform can provide automation with existing legacy system which are being used by customer service center. The automation improves the productivity of the agent using the system , increasing the turnaround time in resolution of the issue, which in turn shows positive impact on customer loyalty program. Data flow happening between different systems is more secured and controlled which is based on the role and profile of the human resources.

4.4 Conceptual Framework

This subsection deals with literature and best practice that can be used for improving the customer service platform in manufacturing industry by introducing the manufacturing cloud concept which is based on the principle of 4th industrial revolution. The different aspects of service platform are summarized in the sub-section by combining the guidelines based on the literature and best practices discussed in this sections. The outcome is the conceptual framework presented in Figure 13.

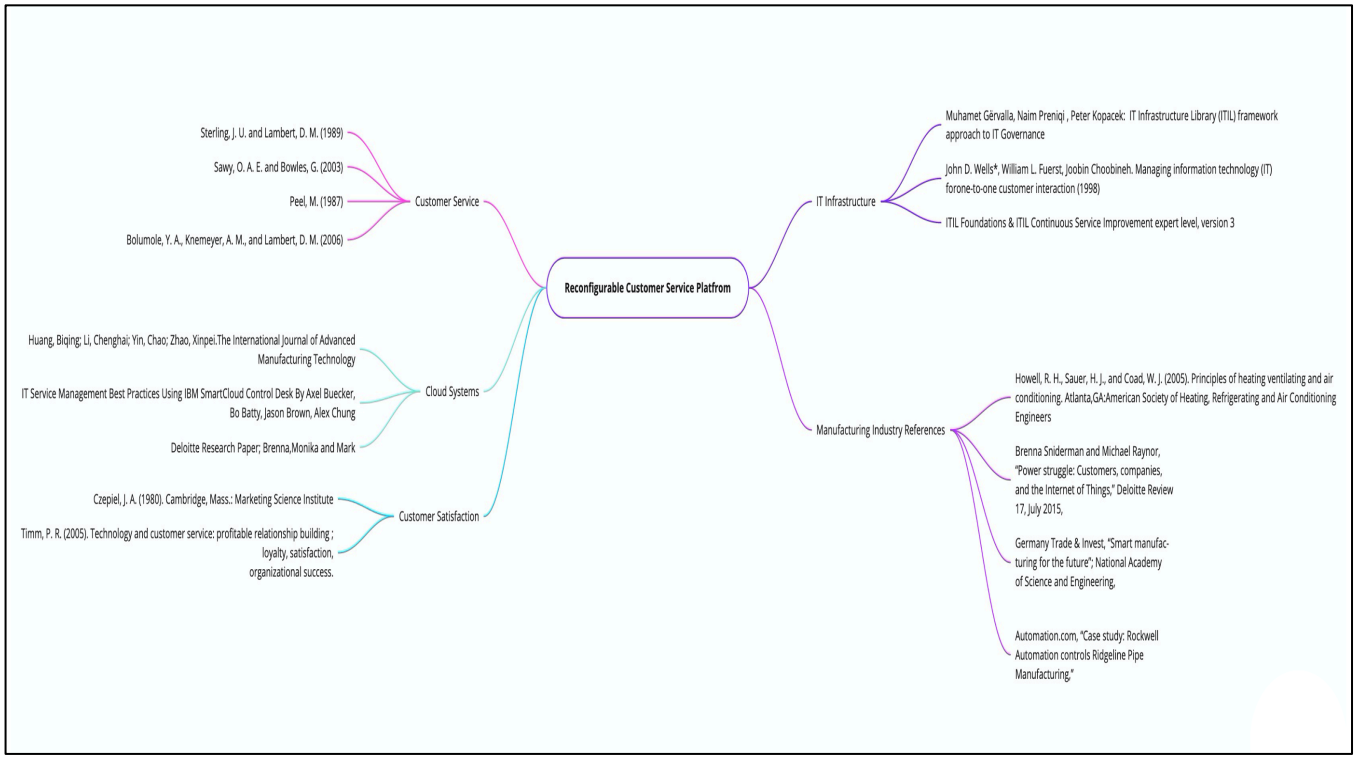

Fig.13- Conceptual Framework for developing Reconfigurable Customer Service Platform

As Figure 13 shows the conceptual framework consists of different tools and systems that have been integrated with the common cloud based service platform. Th e conceptual framework is based on the

theoretical concepts and ideas from the literature review done in this section. The customer service ideas for the service tool were mostly based on the articles based on the customer service and distribution process from Sterling, J. U. and Lambert, D. M. (1989) and Sawy, O. A. E. and Bowles, G. (2003). The solution and idea for building cloud based service platform is from both Cloud system and manufacturing industry literature. As the existing references are helping in building service platform which can follow industry standards like Rockwell Automation and Germany Trade & Invest, “Smart manufacturing for the future”.These ideas and design pattern can be combined to form cloud based service platform principle and guidelines of ITIL guidelines as per Muhamet Gërvalla, Naim Preniqi , Peter Kopacek; IT Infrastructure Library (ITIL) framework approach to IT Governance. The reconfigurable service platform represents best practices and guidelines taken from the different aspects of service platform technically or customer service and loyalty. The industry standards are taken in consideration as the existing manufacturing industry parameters found in the literature review from the publications who work closely with manufacturing customers. The service platform can be build using the ideas from the literature proposed in this section form manufacturing cloud and the references of current implementation done by other manufacturing customer. The customer service guidelines as per the Peel, M. (1987) can be achieved by proposing a tool which adapts as per the changing landscape of manufacturing industry where customer service is as important as the product manufactured.

5 Developing A Common Reconfigurable Customer Service Platform

This section of the thesis presents the design and development details of a reconfigurable customer service platform for Fluido Oy which is for their Manufacturing customers. The design and development includes reusing the existing platform which has been built for an existing customer and enhancing it to be reconfigurable. The new service platform will introduce automation, new technologies and improvement over existing functionality. The section ties together the current state analysis done and the conceptual framework designed after literature review in building the reconfigurable platform.

5.1 Overview of new service platform architecture

The current state analysis helped in identifying the weaknesses in the current customer service platforms. The weaknesses identified are mostly related to the limitation and technical incompetency of the current service platform. The manufacturing customers of Fluido have been working on the improvement of the platform, to help Fluido in developing and design changes from scratch for every manufacturing customer a packaged reconfigurable service platform can make a big impact. The aim of the proposal is to improve the service platform by use of cloud computing and integrating with legacy system for business continuity, and to increase the productivity of the service agent using the old service tools and help manufacturers gain trust and loyalty of their end users.

The new service platform should overcome the weaknesses identified in Section 3 and it is built with the Fluido Oy experts in the fields discussed in Section 4. The fluido experts include a service consultant for improving the service tools, service lead for discussing the suggested KPIs for the improved process and business analyst for communication with customers in regard to process changes due to the new service platform features. The development of the reconfigurable service platform needs to be easy to use and easy to reconfigure the changes, also the strengths of the current platform should be included in the platform. The discussions with the service industry experts have been informal, going through the thesis Sections 3 and 4.

5.2 Technical specification of reconfigured service platform

The service platform proposed should be using cloud infrastructure instead of current on-premise infrastructure which has limitation on accessibility and scalability. Getting all the service and sales feature on same platform will make the information flow smooth and secure. Building the service platform which is having access to sales and marketing application or tools , the service agent access the information required to work with end customers. This section deals with technical changes can be done to make the service platform reconfigurable .

5.2.1 Moving Service Platform to Cloud

In the current state analysis, a key drawback highlighted was the accessibility of secure information and how getting the required piece of information is dependent on cross platform information flow. The sensitive information is to be passed from different applications running on different kinds of infrastructure. The infrastructure is old and utilizes old security models. Moving the service platform to the cloud can give more accessibility to information to the agent working in frontlines with customers. The literature on manufacturing cloud clarifies how the transformation of the information from physical to digital and to physical is helping the manufacturing customer in the new industrial revolution. There are various cloud providers who can support the service platform architecture which is being currently used by customers such as Google, IBM, Amazon, Microsoft and Salesforce. Figure-14 shows the screenshot of the predictive tools which have been made for a current customer.

Fig.14–Cloud based IoT application to show Predictive data

In Figure-14, the predictive tool is giving upcoming maintenance order to the manufacturer also generating quotations for the each repair and maintenance activity scheduled for the upcoming years. The tool is collecting data from equipment installed in the end user remote sites and collecting performance related data through sensors running through IoT devices and feeding the data to the service platform. The information is processed by the machine learning tool on the platform to give a meaningful result to the service agents.

The Cloud infrastructure offers service platform a distributed security setup which is the strengths of the current service platform with added layer of encryption with modern days algorithm. The agent can access information across different geographical location with the cloud-based setup of the pieces of equipments which are installed or being maintained in remote location using IoT. The data collected from these pieces of equipments are shared with the customer for repair and service needs with proper quotation using the cloud features. From Fig.14 , the predictive tool is giving information of the currently installed equipments about the repair and maintenance cost on yearly basis based on the data from currently running operations. This helps manufacturing companies to plan their finances for the yearly new sales and renewals which can help them forecast their profit-loss margins. The machine learning systems are collecting and processing the data to update the service agent about the ongoing problems or upcoming issue with a specific equipment.

5.2.2 Configurable Schedule Automation Jobs

The automation of scheduled jobs which are responsible for passing data from one system to another in service platform is critical. The data flow from one team's application to another team's application is very important in service platform, as sharing information is driving the business. A large volume of data is gathered form the equipments, sales team or marketing team, all this has to be accessible by the service agent . The continuous data flow can be automated by scheduling the bulk data load jobs for each system , these jobs for automation have to be reconfigurable from business to business and customer to customer. These automated jobs are key feature if the reconfigurable service platform as depicted in figure 15.

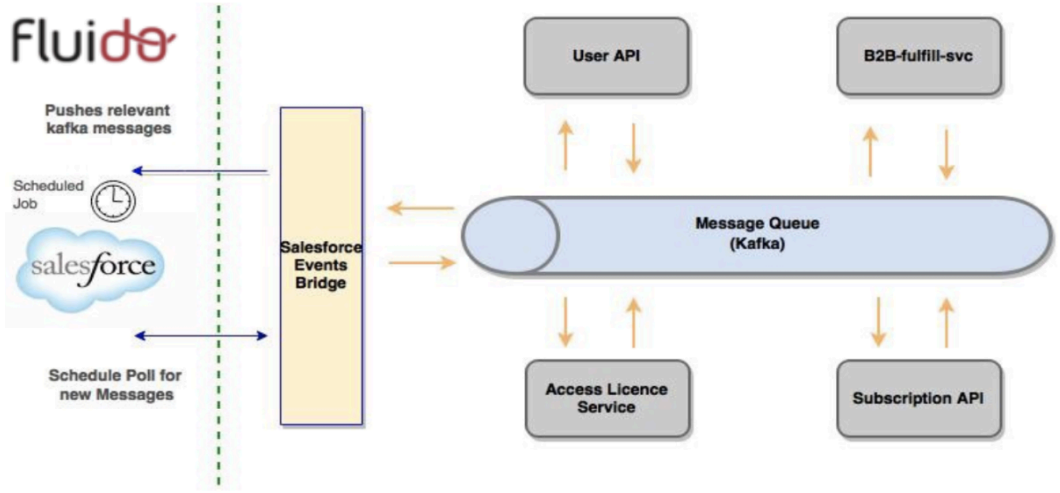

Fig.15- Fluido Service Platform Scheduler Architecture(*Source: Salesforce Scheduler Architecture*)

As per figure 15, the scheduler can be configurable for the automation to work for the Fluido's manufacturing customers. The functionality can integrated in the service platform of any manufacturing customer and scheduling jobs with proper monitoring can be delivered to customers. Lot manual efforts of Fluido consultant and manufacturing customers service agents can be saved by this key features integration to platform. So a bulk import and export jobs for large volume data from different system. The scheduled jobs are scheduled on nightly basis to data are synced between two system , so that the agent working on the different tools on same service platform are sharing same kind of information.

5.2.3 Integrate all Communication channels

The communication channels which are responsible for the taking the customer request can be integrated as the current state analysis showed the issues related to loosely coupled service tools for each incoming channel. The primary communication channels are phone, email and web usually customer have different service tools handling request from these channels and these tools are in running on different platforms so there is duplicity of customer requests. As result different agents using different tools end working for same kind of request for same customer as they are not aware about the request or can check ongoing request in the tool. The integration or bringing all the service tools on same service platform can resolve the issue. The email set can be done on the service platform to handling all request coming from specific support email. The web based online support forms can be integrated using the html form which are linked to service

platforms. The phone calls can be integrated using the CTI (Computer telephony integration) software shown in Fig.16 which can help to integrate the service platform with call center. This CTI setup is reconfigurable as the customer can choose the phone number and language for their call center.

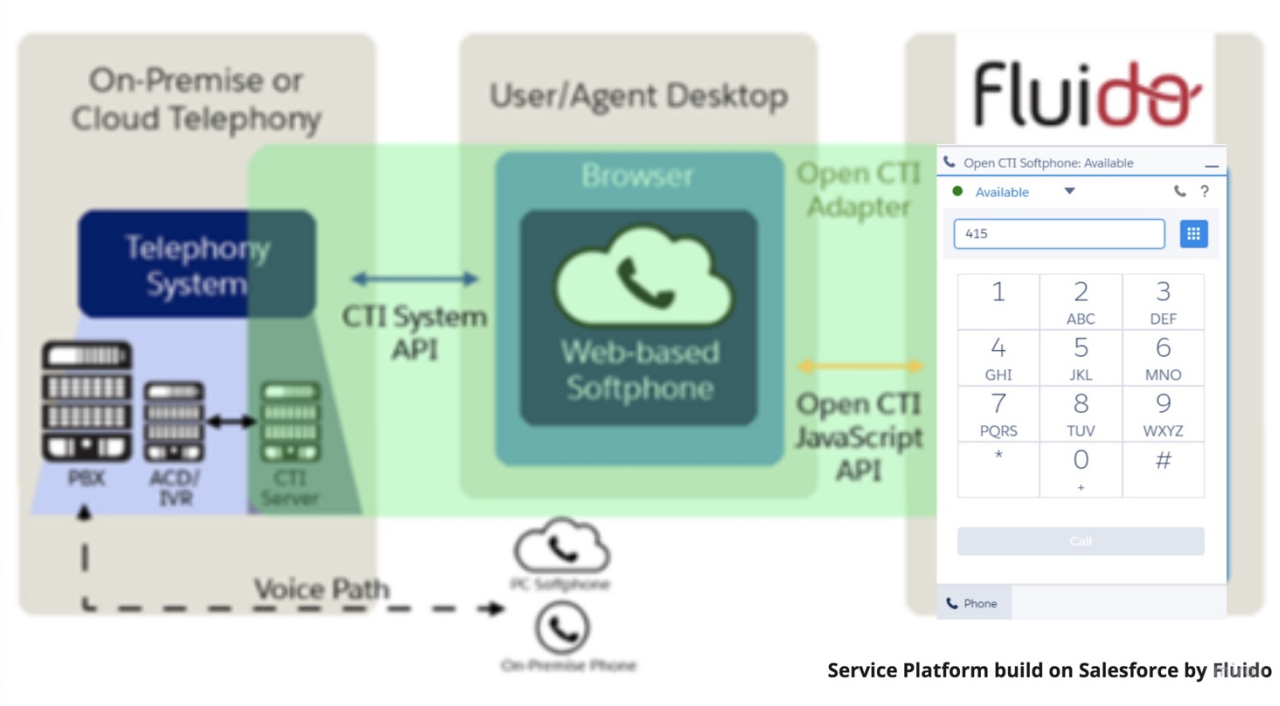

Fig.16- A Salesforce CTI based Call Center setup (*Source: Salesforce Development Guide*)

In the Figure 16, the computer based telephony system are doing most of the heavy lifting of connecting the phone to service platform application for making outbound call or receiving inbound call. Multiple agent working from different geographical location are connected to same network and CTI systems are forwarding all the incoming call to appropriate service agent based on the their location. The CTI configuration are easy to configure, and user interface is very easy to do the set up changes. Fluido's consultant have to integrate and build this functionality for every customer because the phone communication channel is the basic requirement for any support center. Building a configurable CTI system which can be easily embedded to any telecom service provider used by manufacturing customer of Fluido. The CTI toolkit build is on the cloud based infrastructure so that it compatible with any legacy desktop application used by the manufacturing customer.

5.2.4 A 360° console view for Agents

The most important feature which is needed by the service agent working on customer service request is about the user interface of the tool which are they currently using. The agent needs to have single interface which can provide all the basic detail to work on any service request, current state analysis showed they are having with interface as they have to navigate different page or multiple clicks to get basic information while being on call with customers. The service platform needs a new interface which can be made reconfigurable by different manufacturing customer as per their service agents needs. With the concept of 360° view agent can see every detail to solve or complete service request on first customer contact. The 360° view gives the all details of the customer with history trends of their activities as well as the current activities being handled by different agent for the same customer as shown figure 17.

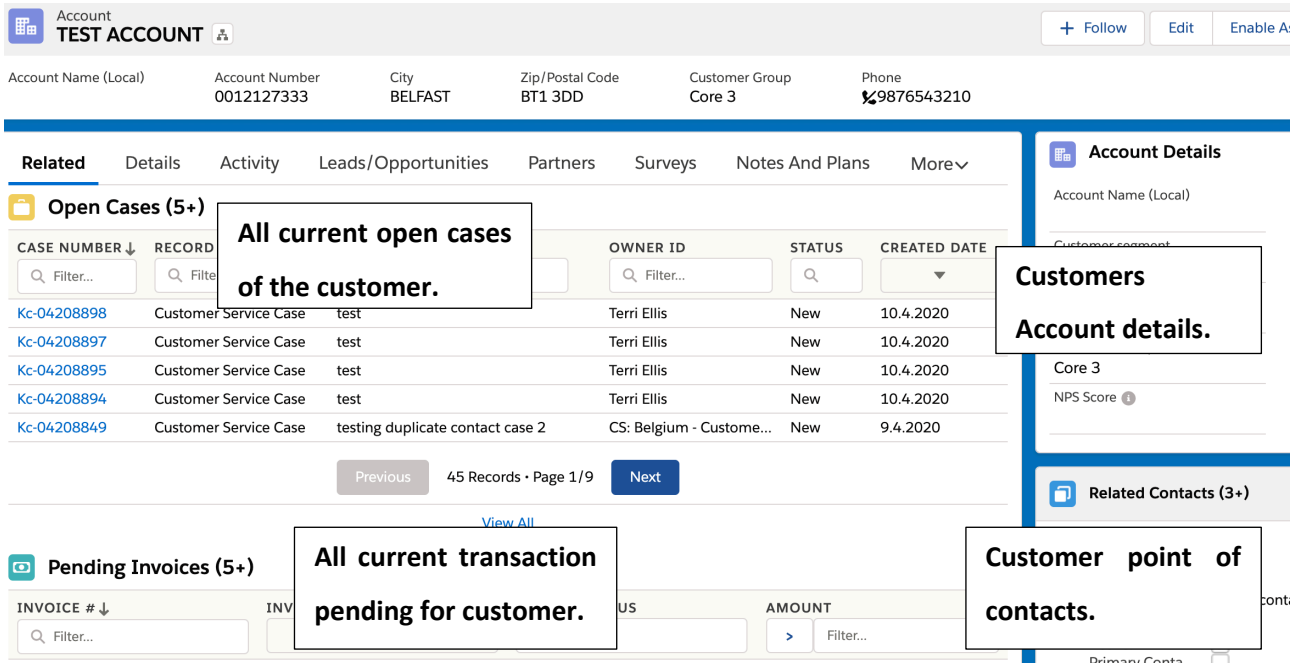

Fig.17- A 360° view from service platform implemented for one Manufacturing customer

Figure 17, shows how the single screen display all the useful information to the agent using the service platform without having trouble of navigating to different screen or clicking multiple links or sections. The view is can be made configurable to the customer so that can configure as per their business and brand.

With new feature of artificial intelligence, the agent is able to work with customer with the use of machine learning on type of the communication done for the customer with sentiment analysis being done for them

the agent. The sentiment analysis gives a behavioral warning while dealing with frustrated customer or angry customer. Below Figure 18 shows the IBM Watson's artificial intelligence architecture.

Fig.18-Sentiment analysis done using IBM Watson Architecture (*Source: IBM AI Architecture*)

Figure 18, shows the machine learning feature embedded on service platform is can be configured for different purpose by customers . The machines learning can be used for auto chat bots , recommendation engine or sentiment analysis tool for the agent to work with customers. The architecture shows machine learning tool takes the data given by the customer and gets trained to by itself processing the data. More the data ML engine gets more accurate results are produced to the service agents.

5.2.5 Configurable Set up for Entitlement Processes

Customer service platform is missing entitlement process, even though there is some service level agreement define between manufacturing customer and their end users. Agent using the service platform are not able to track the service level agreements process defined, so a reconfigurable entitlement process is need for agent to track the time for resolution defined for the issues or requests. The time track for the entitlement process can be placed at the interface on the 360° view of the agent console view like Fig 19.

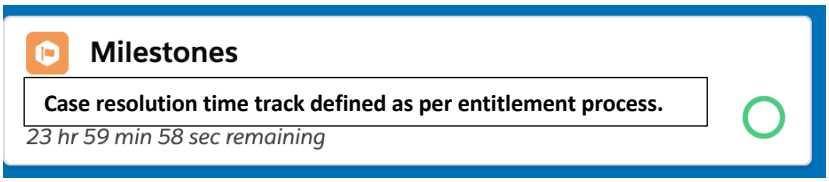

Fig. 19 Milestone tracker from a Customer service platform on Salesforce by Fluido

5.3. Proposal of common service platform design which can be reconfigured

It was identified in the current state analysis that overall the change is needed for the customer service platform used by the manufacturing customers. However, new service platform would also introduce a new way of working for the agent to work on customer service request or issues. The new architecture is integrated with all the legacy system. All the communication channels are integrated with each other and shared commonly among the frontline agents. Agent new platform includes the sales and marketing team's which adds advantage for the data storage is being done at common database. The large data volume flow from service platform to ERP system can schedules and maintained in batches by the organization administrators. The figure 20, shows the architecture of reconfigurable service platform.

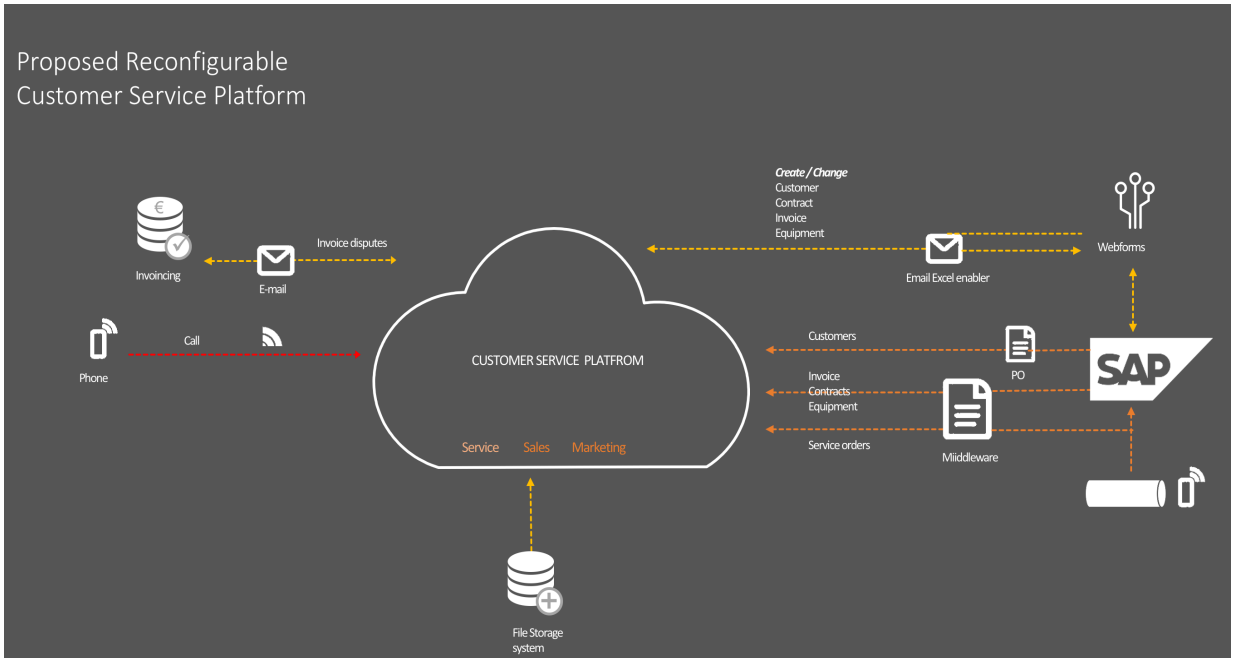

Figure 20 Propose Reconfigurable Customer Service Platform

The design in fig.20 shows that customer service platform is at the center of all the tools and application which are needed in customer service center. The invoice related information is coming to service platform from different tool which is shared service, sales and marketing team so that the collaboration is improve. The phone are connected to platform through CTI software's, the ERP systems like SAP is integrated through scheduled automated jobs.

The proposed cloud based system will have bi-directional flow of system with all the existing legacy system. The different ERP system are now integrated with proposed service platform which is reconfigurable. This is improvement based on the best practices found in concept of Manufacturing Cloud. The Industry 4.0 shows how artificial intelligence, IoT and automation will be increasing the productivity of the service platform. The IT processes improvement can be applied to improvement of the manufacturing companies processes as well. Security and access control cab ne made centralized so that each service or tool doesn't have to maintained by separate set of teams. Proposed platform supports all the aspect of the service and sales model of the organization so that service and sales teams can better collaborate with each other in serving the end users.

6 Validation of Reconfigurable Customer Service Platform

This section validates the design for new customer service platform developed in Section 5. Validation has been done together with the Service consultant and the service leads of Fluido Oy where they have provided feedbacks for the design on the reconfigurable customer service platform .

6.1 Overview of Validation Phase

The aim of the validation phase is to make sure that the reconfigurable customer service platform created in Section 5 is valid enough to be proposed to manufacturing customer to improve their customer service and improve the productivity of the service agent working on the tool. The customer service experience of the end user also improve as the resolution time of request is improving and they are able to maintain their machineries with timely repair job done by the manufacturers .

The validation for the design and architecture of the service platform has been done in two steps. First by having a presentation of the thesis and all the gate work to the service consultants from Fluido Oy. The presentation was done through online meeting scheduled with two experienced service consultant working with Manufacturing customers. They did liked the presentation and supported concept of having reconfigurable service tool which manufacturing customers can own and enhance as per their business model. The second level of validation is done with the service lead for manufacturing industry in Fluido, received some feedbacks over the design and improvements needed to be done to the current architecture.

6.2 Feedback Received for the Service Platform

The data collected from Data 3 was gathered with online meeting with service consultant and service leads of Fluido, who are working with manufacturing customers and are responsible for the requirement gathering and new implementation to their current service platforms. The new service platform suggested in the study and changes it is bringing with it that are feasible and also changing the way of working on service platform for the manufacturing organization. All the information was gathered through the online meeting using google hangout sessions.

6.2.1 Feedback from the Service Consultant

This section discusses the validation for the new reconfigurable customer service platform designed in Section 5. The design was validated for using cloud-based infrastructure, adding automation which could be made reconfigurable as per the customers business model and flow of information directly from physical equipment to the service platform embedding the concept of IoT and machine learning in the service platform.

The presentation for validation with the service consultant was done using the thesis presentation which were prepared for gate presentation, there were suggestions and feedbacks provided by consultants to be considered in the design which can be used in improvements. The suggestion for moving to cloud based infrastructure and usage of IoT with machine learning feature was highly appreciated by the service consultants. They suggested lot of practical usage with machine learning feature for the service agent as well as to the sales and marketing teams using the service platform.

The new cloud-based infrastructure could provide manufacturing organization to downsize their local on-premise infrastructure team. As the cost of maintenance of their local on-premise infrastructure would be reduced as the cloud service provider will be taking care of the uptime of the servers and backup services. The feedback received on cloud-based service platform and how the subscription model for the using the cloud-based services could save lot of money for the manufacturing customer based on usage.

The service consultant had few queries around how reconfigurable service platform would be delivered to customer, so that it’s easy to use and configure by the customers themselves without much complexity. The service platform features need to be in form of package which can be easily installed to any cloud

infrastructure. There is a need for documentation which includes the details of features with service platforms and how to reconfigure as per organizations business model.

6.3 Validation of the specifications for the service platform

The section deals with feedbacks received on the technical specification described in subsection of Section5. The service consultant has validated each technical feature being proposed in the new service customer service platform. The table 2 contains the Data 3 from the validation on design.

Platform Features	**Strengths**	**Weaknesses**
Cloud Infrastructure	Better accessibility to service platform. Security model is good. Cloud infrastructure .	Expensive subscription model and licenses based on per user. Risk analysis on cloud outage .
Automate Jobs	Removes manual execution and monitoring of the large data volume operations.	Cloud limitation may impact on the data volume size.
Communication Channels	The chat, email and phone are embedded on single platform. Supervisor can easily manage bandwidth of each agent .	Complex work distribution matrix need to be set up.
360° View for agents	The agent console have all required information without extra navigation or clicks.	Can be slow based on how much information is displayed on single screen.
Entitlement Process	The SLA of customers are defined in entitlement process.	

Table 2 – Proposed Service Platform Specifications Feedback

The feedback was given service consultants who were involved in initial current state analysis during Data1 , the online presentation from Data2 was used for explaining the design and specifications of the platform. The Data3 collected was in form online session with consultant , the consultant who work closely with big manufacturing customers and work with development of the team for service platform development of enhancements.

6.4 Final Proposal

The final proposal for reconfigurable customer service platform is based on the initial proposal that has been modified based on the feedback received from the service consultants. Some minor changes has been made to the technical specification to the initial proposed design from Section 5 .

The feedback received on the complex work distribution matrix can be achieved through many cloud features which are responsible for work distribution based on agent availability or artificial intelligence. The tedious task of the supervisors can be reduced when dealing multiple channel service platform, the, manual efforts of the supervisors can be reduced. The monitoring of the agent's bandwidth is also reconfigurable this helps manufacturing customers to plan their resource management bases on current trends in agent's availability. The AI engines are doing heavy lifting of work assignment, customers need to upload the matrix and train the AI engines with their existing data for the AI engines to perform on full scale.

The cloud infrastructure related limitation can be dealt with taking more storage space in cloud. The amazon, IBM and google provide extra cloud storage with secondary instances of the servers as back-up in case performance degradation service platform or outage happening on the primary instance of the service platform. Usually cloud provider have their monitoring team for alerting customers about the downtime or degradation on service platforms.

These are minor changes to the existing design proposed in section 5 , the technical specification are added are also easily configurable by manufacturing customers . The changes suggested can improve the usability of the platform for the supervisors guiding and mentoring the service agents.

7 Conclusions

In this is final section of the study is about the objective and outcome of the study. It gives suggestions to for the implementation plan and the prorogation from current platform. This section of the study also shows the evaluation criteria for the service platform proposed and how it meets the customer current business needs.

7.1 Executive Summary for Customer Service Platform

The objective of this study is to introduce a new customer service platform to all the manufacturing customer of Fluido which is reconfigurable. The current service platform development is done from scratch for each manufacturing customer, and the features provided to them are common and can be packaged to build a common reconfigurable service platform. Current service platforms lack the automation with legacy systems most of the features are manual and old. The new digital revolution in manufacturing sector needs the IT infrastructure to reinvent and adopt automation using artificial intelligence, machine learning, Internet of Things and cloud infrastructure.

The research method for this study is action research. The study includes the current state analysis to identify the strengths and weaknesses of the customer service platform of Fluido manufacturing customer and the development efforts in building same kind of service platform for different Fluido customers. Fluido has already build a smart service platform which has been deployed to one customer this could be use as template for all the other service platform with features which are reconfigurable and can be easily deployed to other manufacturing customer. The weaknesses identified are common across different manufacturing customers and different service platforms. The weak points are due to the current service platform infrastructure of the IT systems in place for the manufacturing customers. The main weakness which were identified during current state analysis were multiple source of information for the service agents using the tool, lack of customer details in one UI i.e. lack of 360° view and lack of automation in the service platform which increases the service request resolution time.

The strengths which were highlighted in the current strengths analysis on customer service tool was about the distributed access control in the platform which manages sharing and access of information flow in the platform. The other strength of the platform is about the multiple tools used by the service agent for taking end users incoming request which ensures there is no single point of failure in service platform.

The outcome for literature study is a conceptual framework of customer service platform that introduces technical specification which is part of the next industrial revolution. The service platform is responsible for transformation of digital to physical and physical to digital journey of the data gathered. The design is based on ITIL, manufacturing cloud and fourth industrial revolution. The addition of the technical specification in service platform template helps Fluido development team in repeating same development for different customer and a packaged reconfigurable service platform can be delivered to the manufacturing customer.

The current state analysis was done in collaboration work with experts in Fluido working with manufacturing customers for service platform improvement and to design a service platform with common reconfigurable technical features. The improvements are around the weaknesses collected from the current state analysis of the study. The weaknesses were aimed to improve the agent's usability of the service platform, so all the features which are slowing the agent daily target or slows the repair & maintenance process for manufacturing customers. The agents have to navigate or access different tools to perform daily simple tasks. The sensitive information is flowing from different tools before it reaches to the end user, this causes lot of delay and service level agreements of the manufacturing customer is impacted which raises issues during renewal of contract and customers loyalty. The automation done using artificial intelligence and IoT helps manufacturing customer to gather data of equipment health at customer sites or remote location which predicts the next repair cycle or performance. The field service technicians have all the information accessible to them through cloud services of the platform as result they can get the complete history of the installation in remote location without contacting service center. All this will impact the KPIs to of agent's, as well as layout roadmap for manufacturing customers to improve their products with all the data gathered over the period of time through IoT features. This reconfigurable service platform can be designed using a hybrid cloud which consists of different cloud providers google, amazon, salesforce and IBM. The validation of the proposal has been done by Fluido service consultants and one of the big manufacturing customers is already is using the such kind of service platform. The suggestions from the consultants and developer has been taken into account for the final design for improvement of the reconfigurable customer service platform has been was formed.

The new improved customer service platform helps manufacturing customer to do proactive repair & maintenance jobs for their end user. The equipment maintenance time and quotation are generated in advance and shared with end user which helps the customer and manufacturers to plan their financial budgets in advance. In remote location where the customer and field technicians usually can't reach for timely repair services the IoT feature helps to decommission or commission a site. Customer satisfaction and loyalty is increase as manufacturing customer can partner with Fluido for their business growth.

7.2 Define timelines and prioritization for implementation plans

The section deals with the timelines for implementing the proposed reconfigurable service platform and how the implementation plans can be prioritize based on the features defined in the service platform.

The timelines can be defined for the implementation of the service platform based on factors like size of the organization, user base, volume of the request coming in, business process involved in the organization and the legacy integration working currently. The duration of the implementation is decided by the factors discussed above, as the service platform is configurable but has to fit the needs of the organization and setting up the configuration changes takes time based on the volume and size of the data need to be handled.

Prioritization of the features are done in phases during implementation, the rollout of customer service platform is done in phases by adding piloting features to certain group of user and taking the feedback based on the pilot duration and making changes to the platform. After that changes are rolled out to larger group of user for usage, manufacturing customer have service center in different geographical location decision has to be made to pilot for those geographies which are smaller user base and based on their feedback decision can be made by the process owner for rollout on large scale.

The feedback collection can be done in collaboration with key users from each frontline team by having a weekly touch base call with the key users. A training module can be created for the key users to provide them required training for onboarding them and configuration features on the service platform. Rollout decision are taken by manufacturing customers solution leads, where the demand is big customers rollout the service platform for that location initially.

7.3 Thesis Evaluation

This section evaluates the customer service platform developed as an outcome of the thesis is aligned with the business problem stated in the beginning of the thesis and the objective. Discussion is about how reliable and valid is the work done about the development of platform in the thesis.

The researcher has to make the research outcomes to be more generalized so that readers can understand and interpret idea and logic behind the work done by researcher. The work done should be proved for quality based on the research outcomes. There are various criteria to map the research quality to clear out queires related to outcome that, it is not a thought of the writer only (Quinton et Smallbone 2006). The various important criteria of research quality which are used for evaluation of this thesis are:

Validity and Reliability

Credibility

Relevance

Logic

The validity and reliability are one of the most important features ensuring the quality of the research work.

Logical evaluation of the thesis is done based on the valid strengths and weaknesses of the service platform and the efforts required to develop it. The pros and cons list of these features and choose the pros and embed them in service platform is the logical quality of the research. In this thesis, logic is deduced from the analysis, interpretations of data from current state in a way that it is easy to understand. It is important that the each and every stage of the research is logical that means from beginning to the end of the research including the planning phase in this thesis it was about the research design. To ensure that all the decisions taken are based on the proper facts and arguments in the research.

Relevance stands for the research done in data collection i.e. interviews, meeting and documents referred is related to the of the thesis. Data collection from correct source is a guarantee of the relevance for research. As per (Quinton and Smallbone 2006:136) "judged by an assessment of the importance of the topic within its field and what contribution it makes to the literature." Is the relevance of the research. Its stands for collection data for the same topic from sources and the right people involved are important for the relevance of the literature.

Reliability in the research is derived carefully from the people who were involved in the study and based on the process and also people involved in the pilot project. The reference of the documented research which can be considered as the source of reliability, as some other researcher can also draw conclusion based on the on the same kind of data. (Blaxter et all 2010) For quantitative (numerical) data the reliability of the data can be ensured by demonstrating consistency of the results as well as the robustness of the measurement tool. Reliable study help to make sure that the final proposed product is not overlapping or redundant with an existing product in use and help in the product development. Reliability of quality data can be slightly less dependable when compared with quantitative data as there is no tests for reliability of data. (Quinton and Smallbone 2006) Collecting data from different tools to answer the same question is called triangulation. Triangulation may help to understand collection of the data which is collected from different source and arrive to the same conclusion from different sources. Therefore, reliability of data can be assured by multiple data sources and using different tools for collecting data or collecting the data at stages. In thesis data was collected from organization document and as well as from the workshops conducted with the customers.

(Gillham 2010) This doesn't mean data collected from different sources is wrong or cannot be used , but the results differences needs to be justified.

Validity means thesis finding or outcome is aligned with the objective and business problem and any one who is accessing thesis is sure about work estimate needed (Quinton & Smallbone 2006). Research data with proper format is required to show the evidence for research and also proves that enough data is collected and analyzed before drawing conclusion on strengths and weaknesses of the tools. The design changes selected are valid based on the best practices followed in manufacturing industry standards.

The credibility of the thesis is about number of credible scholarly article or journals are referenced in the research. Taking reference of the literature is which published and already a standard in the field of research give enough proof for an credible report. The more the references and mentions of the published research work ,more is the support for the result derived from the study.

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Interview questions for Data 1

Question 1	What is your role in Fluido?
	How is the role helping Fluido customer related to service platform? (Customer requirements analysis)
	How long have you been working with the Manufacturing customers?)
Question 2	Can you describe the current service platform challenges faced by customers? In few words or with an example-
Question 3	What are the strengths of the current service platform of the customer?
Question 4	What are the weakness of the current service platform?
Question 5	What are the big improvements customer is looking related to process or flow in current service tool or platform?
Question 6	What is the process followed by you in doing effort estimation and development planning?
	How is the release scheduled or rollout planned for the accounts?
Question 7	What are the other roles which are key in design and effort estimation?
Question 8	How you project the plan or design for the new service tool to customer?
	In order to get approval from customer what are the main parameter which interest the customer for the new platform?
Question 9	How do you plan the release or roll out plan for new platform?
	What are the roles from customer which are responsible for giving the signing off the new platform?
Question 10	How customer measure or validate the improvement over new platform?
Question 11	Anything else you would like to mention about the service platform implementation's?