

# Implementation of Sustainable Complex Interventions in Health Care Services: The Triple C Model

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## Research article

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# Abstract

**Background** The changing and evolving healthcare means organisations are under increasing pressure to deliver value-based, high quality care to patients through enabling access, reducing costs and improving outcomes. These factors result in an increased pressure to deliver efficient and beneficial interventions to improve patient care and ensure sustainability beyond the scope of the implementation of such interventions. This paper discusses the development of a triple C model for implementation that ensures sustainability of complex interventions in health care services.

**Methods** In order to develop the proposed implementation model, we adapted the formal tradition of theory building that is described in sociology. Firstly, through a review of the literature on complex interventions and the available implementation models used to embed these interventions. Secondly, devising a framework that encompassed these findings into a simple and workable model that can be easily embedded into everyday practice. This proposed model uses clear, systemic explanation, adds to the current knowledge in this area and is fit for purpose, providing healthcare workers with a simple easy-to-follow framework to embed practice change.

**Results** A three-stage implementation model was devised based on the findings of the literature and named the Triple C model (Consultation, Collaboration and Consolidation). The three stages are interconnected and overlap to ensure sustainability is considered at all levels of the project ensuring its greater success. This model considers the sustainability within any implementation project. Sustainability of interventions are a key consideration for continuous and successful change in any health care organisation. A set of criteria were developed for each of the three stages to ensure adaptability and sustainment of interventions are maintained throughout the life of the intervention.

**Conclusion** Ensuring sustainability of interventions requires continuing effort and embedding the need for sustainability throughout all stages of an implementation project. The Triple C model offers a new approach for healthcare clinicians to ensure sustainability of organizational change.

## Background

Given the changing landscape of healthcare in recent years, providing high-quality care through the implementation of evidence-based innovations whilst also reducing costs has become a priority for healthcare organisations [1]. While providing value for the patient is important, in order to achieve value-based healthcare, sustainability of implemented interventions is crucial. In areas identified for improvement, the implementation process needs to be simple with sustainability a key focus throughout. The necessity of coordination, cooperation and working together across areas is critical to achieving success [2]. It is important to consider how the complexities of healthcare influence the implementation process.

### Complex interventions

The high prevalence of chronic conditions, aging populations and new endemics have increased the pressure on health services to incorporate interventions seen as “complex interventions” [3,4]. Depending on the area of focus, interventions often contain a number of components with possible interactions between them that result in a range of outcomes to improve the health care delivery and increase patient safety [5,6].

Numerous papers report complex interventions that have been integrated into health care practice to improve the safety and quality of care provided to patients [7-12]. The types of interventions range from behavioural, technological, organisational and clinical and include a variety of consumers in health services. An early study by Campbell and colleagues has highlighted the importance of determining the effectiveness of complex interventions in health care and detailed a step-wise approach for the design and evaluation of such interventions [13]. They based their work on the Medical Research Council Framework for the development and evaluation of randomised controlled trials for complex interventions [14]. Moreover, the authors suggested that the steps needed to be involved, include a clear definition and understanding of the problem and its context, development of the intervention and finally optimising the evaluation of the intervention based on three possible scenarios. These included a consideration of the cost and resources involved, the evidence supporting the benefit of the intervention and finally the cost benefit ratio of the intervention [14].

## **Theoretical models**

Many theoretical models have evolved to simplify the implementation of such interventions and provide information about evaluation of these interventions [15-35]. The terms, theories, models and frameworks have been used interchangeably in implementation science literature. However, they are distinct in their definitions. A theory usually provides a clear explanation of how and why a specific phenomenon exists [15]. A model is usually descriptive as opposed to the explanatory nature of a theory. Models are also sometimes referred to as a narrow form of a theory. Frameworks on the other hand do not provide explanations, they are a set of empirical phenomena that are translated into a set of categories. The current theories, models and frameworks used in implementation science have been summarised by Nilson (2015) in order to make sense of the available methodologies. They all fall under three overarching objectives; guiding the process of translation of research into practice, explaining what influences implementation outcomes and evaluating implementation [15].

Process models for evidence implementation originated mainly in the nursing field [5,11]. Some examples of known process models include ACE (Academic Center for Evidence Based Practice) Star Model of Knowledge Transformation, the Knowledge to Action Framework, the Iowa Model, the Ottawa Model for Research Use and the Joanna Briggs Institute (JBI) model [18-21]. The focus of these models is on how to implement evidence into practice. Their main emphasis is on careful planning using a stepwise linear approach to implementation as one step usually follows another.

Frameworks for implementation usually include steps that identify barriers and facilitators to implementation specifically taking into account the context in which the innovation is being implemented

[24-28]. They do not provide an explanation of how things are done or recognise that implementation is multidimensional with many variables interacting with each other. Theoretical domains frameworks usually rely on theories related to behavioural change and social cognitive theories. Most of these theories rely on either individual or organisational change, climate, culture and leadership. Examples of these types of frameworks include: Promoting Action on Research Implementation in Health Services (PARIHS), the conceptual model, Ecological framework and Consolidation for Implementation Research (CFIR) [9,27,28]

The third type of implementation methodology is evaluation frameworks [32-35]. These frameworks provide a structure for evaluating implementation or quality improvement projects. Examples of these include Re-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) and PRECEDE-PROCEED (Predisposing, Reinforcing and enabling constructs in Educational Diagnosis and Evaluation-Policy, Regulatory) and Organisational constructs in Educational and Environmental Development [32-35].

In this paper firstly, we will focus on examining and identifying the facilitators and barriers involved with complex interventions and provide alternate theoretical framework - The Triple C model - as a simple easy to use model for clinicians to use to implement interventions and ensure sustainability in clinical practice. Secondly, we will provide examples demonstrating successfully use of the model across a range of health care settings and areas of practice including; wound care, medication safety, palliative care, oncology and haematology.

## **Method**

In order to develop the proposed implementation model, we adapted the formal tradition of theory building that is described in sociology [36–38]. The authors defined theory as a body of ideas that form the basis of three types of conceptual work; describing, explaining and predicting observed phenomena. We undertook a two-stage process. Firstly, a review of the literature on complex interventions and the available implementation models used to embed these interventions and secondly, devising a framework that encompassed these findings into a simple and workable model that can easily be embedded into everyday practice and yet fit the criteria of a theory. These criteria include; accurate description- this refers to the clarity of definitions used in the model, systematic explanation-this refers to the provision of enough explanation of the phenomenon in form of causal or relational mechanisms, knowledge claims- this refers to the use of theory in resulting knowledge claims in the forms of explanations, analytical propositions or experimental hypothesis and investigation- this refers to that fact that theory must be tested to ensure its concrete and fit for purpose.

## **Results And Discussion**

### **Barriers and facilitators of complex interventions in health services**

Several factors have been identified in the literature as barriers and facilitators for implementing complex interventions as shown in Table 1 [39-51]. Common barriers across the studies included: education and training needs of staff, lack of leadership support, time constraints, complexity of intervention, lack of staff engagement and poor management and communication. Facilitators for implementing interventions included: sufficient resources, engagement of stakeholders, staff involvement and support from leaders and staff. Most of the barriers and facilitators cited in the literature were related to human factors and staffing issues rather than the type of intervention. The complexity of intervention was only cited in a few studies [39-51].

Human factors are by far the most complex to address when implementing interventions in health services as opposed to organisational factors [52]. Several key factors were identified from the literature. Understanding human behaviour, decision-making during critical situations and identifying sources of errors are key considerations and have the potential to influence the success or failure of project implementation. Moreover, effective teamwork requires cooperation, coordination and communication between the various team members [53]. Effective communication between and within teams enables cooperation and coordination. To ensure success every member of the team requires an understanding of the purpose, team roles, responsibilities, task requirements and the project plan. Trust in other team members and sharing information are also essential to enable cooperation between teams [52-56].

The synthesised model of implementation (the Triple C model) builds on these key human factors to enable successful implementation of complex interventions in health services as described in the next section [57].

### **The development of the Triple C model**

The Triple C model proposes that to achieve successful implementation in health services requires attention to the social relations and processes that will result in outcomes. The three main elements of the Triple C model have been explained fully elsewhere [57].

It emphasises the processes by which complex interventions can be made practicable and embedded into daily clinical care by underscoring the significance of human factors. A three-stage implementation model was devised based on the findings of the literature and named the Triple C model (Consultation, Collaboration and Consolidation) as shown in Figure 1. The three stages of the model are interconnected and overlap. As opposed to other models, this model considers the sustainability factor of any implementation project from the project outset and at each stage of the implementation process.

Sustainability of interventions are a key factor for continuous and successful change. Examples of sustainability strategies include: long-term action plans, tracking of program adoption, financial planning and mapping of the community settings where interventions take place. Sustainability has been defined in the literature as routinization, institutionalisation, durability, maintenance and long-term follow-up of an implementation [10,34,52,53]. Stirman and colleagues suggested that for an intervention to be sustainable certain core elements of the initial intervention must be displayed and maintained after the

initial implementation of the intervention [58]. Moreover, most researchers have conceptualised implementation to be the last step of any implementation process. The Triple C model conceptualises sustainability as a set of processes that occur throughout the life cycle of any implementation process. The continuous consultation, collaboration and consolidation ensures that sustainability is not an end point but is a continuous process whereby the three stages are interconnected and overlap with each other to achieve sustainment [57].

Furthermore, health service research studies have increasingly recognised the value of adaptation in light of the everchanging context of health care services. Adaptability of an intervention to local context is necessary to ensure the usability and relevance of such interventions [59]. The relationship between adaptability and sustainability has been discussed in depth by Shelton et al., 2018. The authors highlight the importance of identifying barriers and facilitators to adaptability of an intervention to ensure its sustainability [10]. This is in addition to ensuring the core elements of the initial intervention are still maintained. The Triple C model allows for adaptability and sustainability through the continuous engagement of project stakeholders.

### **The consultation stage**

The consultation stage is typically the initial stage of any implementation model and this is where all stakeholders are able to prioritise their workflow and initiate ideas and suggest areas for improvement. This stage should capture all the stakeholders' priorities and map the pathway that will be taken to ensure the successful implementation of the project. A process map of the key steps involved in the project ensures a clear pathway of the project trajectory, areas for improvement and monitoring as shown in Table 2. To date, process mapping has not been used extensively in health care [60]. A study by Antonacci et al., 2018 highlighted the advantages of using process mapping for planning projects in health care [11]. The authors highlighted five key factors for successful process mapping including: appropriate and easy visual representation of the project; information collected from stakeholders; the ability of the facilitator to gather ideas from those involved and capture them on the map; knowledge of software and equipment used if needed and the ability to follow-up any missing steps or information throughout the process.

### **The collaboration stage**

The collaboration stage aims at identifying who should be involved in the project based on their skills, knowledge and contribution to the overall project. This stage requires a high level of communication and openness between team members. Nystrom et al., 2018 highlighted the importance of collaboration on health projects from an interdisciplinary perspective to ensure the success of the project [12]. Several collaborative approaches can be used for successful implementation. These methods range from including higher degree students in the projects, clinicians having dual roles in the project as researchers and clinicians and involving staff from various levels of healthcare [12]. The challenges of successful collaboration include lack of clarity around roles and responsibilities in the project plan, organisational changes such as staff turnover, changing of policies or priorities and cultural differences amongst the

project team [41,49-51]. On the other hand, enablers of good collaboration include established relationships, alignment of goals and priorities, skilled team members, clear communication, mutual trust and honesty between team members as shown in Table 2 [39,44,50,51].

### **The consolidation stage**

This stage is the most crucial step in the model as it ensures the sustainability of the project and its incorporation into routine clinical care [3,24]. This stage may involve refinement of the initial ideas to ensure their successful adaptability to the local context while still leaving the core elements of the initial project unchanged. This stage is also done in each of the other earlier stages with the refinement process, consultation and collaboration are employed to ensure agreement about the project steps and its success. Consolidating successful interventions in a dynamic health service is challenging as it requires the use of a number of strategies, adapted to local context, that need to all work in sync. This process needs a few steps as follows; firstly, standardising policies and protocols across the health care setting to ensure minimal variability across departments; secondly, eliminating variances between policies and practices to ensure that processes are understood and orderly. Thirdly, having the right staff mix, with the appropriate skills and experience at all times; fourthly, having an idea about expected patient numbers that will benefit from the proposed intervention and ensuring that resources are available to meet any possible increase in numbers [3,24]. Finally, having access to business intelligence tools to continue and refine outcomes based on real time numbers is crucial for the success of this step as shown in Table 2.

All the elements discussed above on each of the three stages of the Triple C model have been mentioned by Proctor et al., 2015 to ensure sustainability of interventions [35]. The authors suggested that for sustainability of evidence-based interventions to occur, various factors need to be included in implementation models and these are training and funding, context, definitions and conceptualization and measurement and analysis. These factors have been captured by the above three stages through having the right skills mix of staff and resources, clarity of responsibilities, process mapping and having access to business intelligence tools respectively as detailed in Table 2 for each of the above stages [35].

### **Examples of using the Triple C model in health services research**

The Triple C model has been used in several projects to verify its fit for purpose and to ensure its applicability to implementation science. This is the final stage of building a theory as stated above. The Triple C model was used in the successful implementation of an electronic wound care program across several organisations to track wound healing and costs in rural Victoria in Australia [61,62]. The authors were able to show a significant improvement of wound healing times and decreasing dressing [62]. The researchers used the consultation stage to identify priorities areas of research and a map of operations for the project delivery. Sufficient resources were made possible by engaging multiple stakeholders early in the project through both in kind and financial resources. The collaboration stage was crucial as this project involved several organisations and training programs to ensure the successful delivery of the project across the multiple sites. A train-the-trainer program was devised to ensure efficient implementation of the program. The consolidation stage involved several steps such as standardising

policies and procedures across all sites on management of wounds across the rural region and the establishment of a regional wound consultant role to oversee the project after its expiry. This was in addition to continuous data collection across the sites to ensure quality monitoring of wound healing and costs and its consistency with the initial plan of the project [61].

The second project where the Triple C was used was in the implementation of a medication safety program in an Aboriginal Health organisation in a large regional area in Australia [63]. This project employed a two-stage methodology. The first stage was consultation where interviews were conducted with staff and Aboriginal Health professionals to identify problems with medication issues in the Aboriginal community. The results from these interviews have informed a process map about the intervention to address the needs identified in the consultation stage [64]. The collaboration stage consisted of identifying the staff mix to deliver the intervention. In this case, it was a medication safety program consisted of staff training and development of policies addressing medication safety to be made available for all staff through an online platform. The consolidation stage of the project involved collation of data regarding satisfaction with the program and medications incidents [63,64].

Another project where the Triple C model was employed was the development of a skills matrix to identify areas of need to upskill palliative care nurses [65]. The overall objective of the project was to design and deliver educational programs that are relevant to the needs of palliative care staff across a large rural region involving several organisations. The project started with several consultation sessions addressing the training needs of staff involved in several organisations. Once the needs were identified, a process map regarding the delivery and implementation of the intervention was designed which included the development of a skills matrix to be used by managers for individual staff appraisals and identify their training needs and their levels of progress throughout the year, as the training occurs. The consolidation stage involved the use of this matrix as a standard form for staff appraisals and discussion about opportunities for future improvements [65].

A final example of a project using the Triple C model in practice was the implementation of the validated Distress Thermometer to improve identification, assessment and management of distress in the cancer care inpatient wards. This project was the result of a clinical incident and a root cause analysis recommendation. The setting for the project was the private and public inpatient oncology wards at a large tertiary referral hospital. Initially, the project involved consultation with all identified stakeholders to ensure buy-in and identify areas for improvement across the public and private settings. Next, a procedure for management of patient distress in the oncology inpatient setting was developed in collaboration with multidisciplinary teams across oncology including; nurses, doctors and social workers. Staff were involved in the development of strategies that would be used to change practice including initiatives such as regular education sessions on identifying and managing distress for patients admitted to the cancer care inpatient wards and debrief sessions for staff where at-risk patients could be identified. The consolidation stage involved modifications to existing clinical documentation as well as the availability of a patient information brochure for patients and families to ensure sustainability of the changes [66].

## **Limitation of the model**

While this model is adaptable to many contexts as shown above by the variety of projects, its utilisation will be limited by the resources available and time needed for each project. In addition, capacity and capability of staff involved in the implementation will influence successful use of the model. The availability of the business intelligence tools is also a limitation if electronic medical records are not embedded in the hospital system or if there is no method of collecting data automatically as this can be a very laborious task.

## **Conclusion**

This paper has presented the conceptualisation and application of the Triple C model of implementation, highlighting the importance of considering sustainability at all stages of a project. The model is based on theory building in sociology where a literature search identifying barriers and facilitators of complex interventions were mapped followed by a framework design incorporating the findings. The design of the framework was adapted from a sociology theory building concept based on description and explanation of the key concepts involved followed by aligning of the knowledge formed with evidence from the literature. Further elements to the model were added to ensure its sustainability and these were adaptability to local context and the introduction of business intelligence tools to ensure its continuous improvement and becoming embedded into practice. Using the Triple C model in health services projects ensures clinicians have a simple easy-to-use framework for implementation, that is fit for purpose and considers long-term sustainability.

## **Abbreviations**

Triple C. Triple C refers to Consultation, Collaboration and Consolidation.

## **Declarations**

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### **Authors' contributions**

HK designed the study, undertook the databases searches, drafted the manuscript, HK and KK undertook the data analysis and data extraction. Both authors read and approved the final manuscript.

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## Availability of data and materials

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## Ethics approval and consent to participate

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## Consent for publication

The authors consent to publish the manuscript.

## Competing interests

The authors declare that they have no competing interests.

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## Tables

**Table 1. Barriers and facilitators of project implementation**

<b>Study</b>	<b>Country</b>	<b>Interventions</b>	<b>Barriers</b>	<b>Facilitators</b>
Bach-Mortensen 2018 [39]	UK	Evidence based interventions	Organisational culture Lack of Support and expertise	Engagement of central stakeholders, funders, clinicians
Barnett 2011 [40]	UK	Health care innovations	Lack of quantitative evidence The influence of human-based resources the impact of organisational culture and resources	Interorganisational partnership
Bird 2014 [41]	UK	Complex mental health interventions	Lack of staff skills to deliver the intervention Complexity of intervention Time constraints Lack of reimbursements and incentives	Ongoing support and supervision Relevance to organisational culture and values Cost benefit ratio
Bergs 2015 [42]	Belgium	Surgical safety checks	Workflow adjustments Staff perception	Good leadership Relevance of intervention and local context
Colvin 2013 [43]	South Africa	Task shifting interventions	Lack of evidence about the intervention Lack of training, supervision and support	Teamwork
Ling 2012 [44]	UK	Integrating care	Organisational structure Lack of Information technology	Staff Involvement and support Relationship between leaders

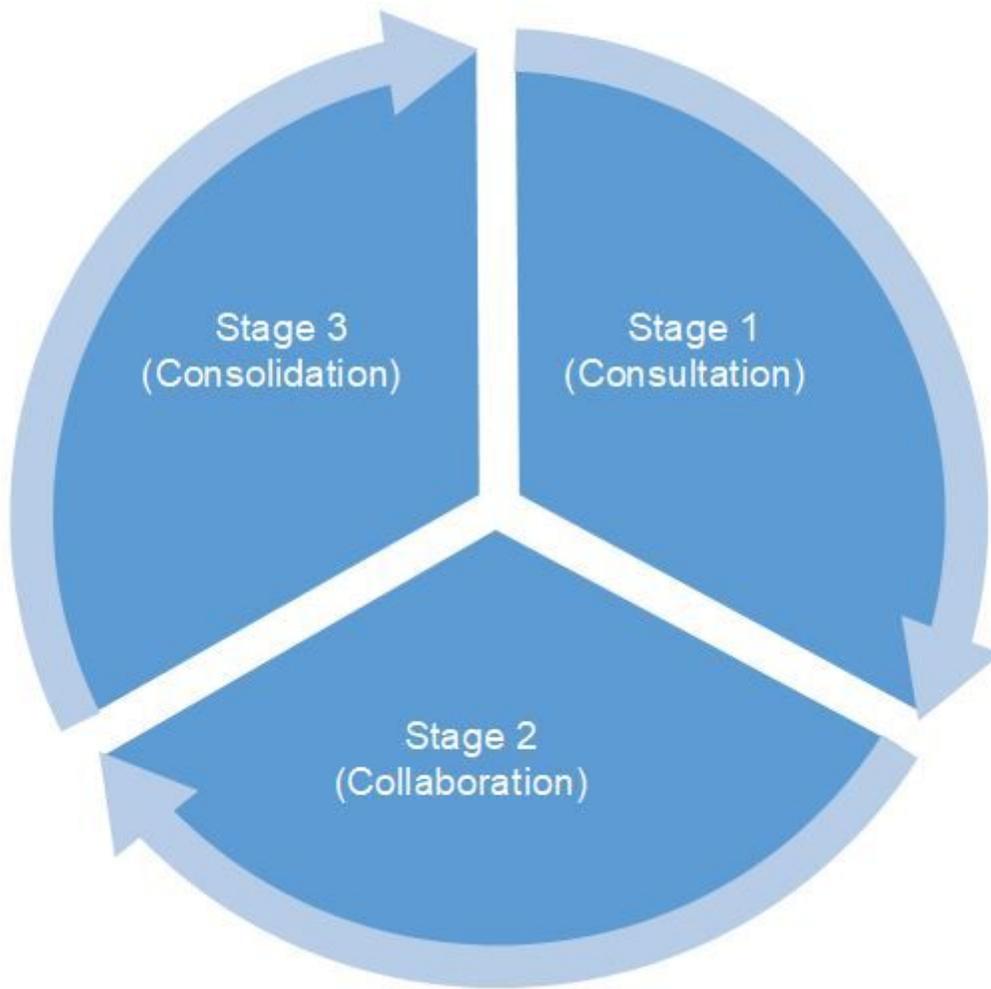
			Financial arrangement	
			Governance	
Humphries 2014 [45]	Canada	In program management	Organisational structure and process	Successful individual interaction with others in the organisation
			Organisational culture	
Kormelinck 2020 [46]	Netherlands	complex interventions for residents with dementia	Communication and coordination between disciplines	Sufficient resources
			Lack of Management support	Openness to change (Organisational culture)
			Unstable organisations	Strong leadership and support of champions
			High staff turnover	
			Perceived work and time pressure	
McGinn 2011 [47]	Canada	Electronic health care records implementation	Lack of time and workload	Patient and health professional interaction
			The degree of difficulty of the interventions	
Pescheny 2018 [48]	UK	Social prescribing services	legal agreements	Positive leadership and management
			staff turnover, staff engagement,	Relationships and communication between partners and stakeholders
			Lack of infrastructure	
Verberne 2018 [49]	Netherlands	Paediatric Palliative care interventions	Lack of clarity of tasks	The simplicity and clarity of the intervention
				The recognition of the need of the intervention
Vlaeyen 2017 [50]	Belgium	Fall prevention interventions	Limited knowledge and skills	Good communication
			Staffing issues	Availability of resources
			Poor management	
			Poor communication	

Wood 2017 [51]	UK	Collaborative care addressing depression interventions	Lack of role clarity	improving inter-professional communication
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**Table 2. The components of the Triple C model**

<b>Stages of the Triple C model</b>	<b>Enablers</b>
<b>Consultation</b>	<ul style="list-style-type: none"> <li>· Prioritising of ideas</li> <li>· Identification of areas of improvement</li> <li>· Design of a process map</li> </ul>
<b>Collaboration</b>	<ul style="list-style-type: none"> <li>· Clarity around roles and responsibilities</li> <li>· Understanding of organisational change</li> <li>· Culture of the organisation</li> </ul>
<b>Consolidation</b>	<ul style="list-style-type: none"> <li>· Standardising policies and protocols</li> <li>· Eliminating variances between policies and practice</li> <li>· Right staff mix with appropriate skills</li> <li>· Knowledge of patients' numbers</li> <li>· Sufficient resources</li> <li>· Business Intelligence tools</li> </ul>

## Figures



**Figure 1**

The Triple C model (Consultation, Collaboration and Consolidation)