A Supply Chain of Children

An Application of Value Chain Analysis Techniques in an Organisation Rescuing Railway Children in India

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Abstract
The paper describes the application and adaption of VCA techniques developed in commercial environments to Sathi an Indian charity which is involved in the rescue of runaway children that end up on railway stations in Indian cities. Various challenges are identified, particularly the need to develop appropriate key performance indicators for a child rescue process and the challenges of achieving understanding and acceptance of process orientated thinking in a socially orientated organisation. The paper concludes by suggesting that value chain analysis has significant potential benefits in improving the efficiency and effectiveness of operations at Sathi and other similar organisations. It is also suggested that VCA could be of benefit to financial donor organisations in monitoring and evaluating the performance of their recipient charities or non-government organisations.

Keywords: value chain analysis; lean; key performance indicators; non-government organisations; child rescue; Sathi.

The Case Study Context: Railway Children and Sathi
It is estimated that there are some 12 million street children in India. Many children who run away from home use the train as a means of escape. Surveys suggest that across 50 mainline railway stations at least 120,000 children arrive onto the platforms every year (http://www.railwaychildren.org.uk/). Once on the platform they must survive; some beg, some steal, some collect and sell rags or bottles, some work for station vendors or cleaning trains. They are vulnerable to a variety of threats including exploitation, abuse, drug-taking and trafficking. Many children move away from the station into the street after a few days, some stay longer and make their home on the platform as this is a relatively safe place compared to other areas in the cities. The majority of runaway children are in their early teens, but children of all ages can be found on the platform, some as young as three or four who might have been deliberately abandoned by their parents or who have lost their parents in the crowded stations.

Sathi (Society for Assistance to Children in Difficult Situations) is a charity that was established some 20 years ago with the specific aim of the rescuing children from railway platforms. It now operates on 12 railway stations in major cities across India and is one of a number of charities focused on rescuing 'railway children'. The Sathi head office is in Bangalore and it has over 120 full-time staff across India supplemented by a significant number of volunteers.

Sathi's primary objectives as outlined in their mission statement are to :

- Create a safe and secure environment for runaway children rescued from railway platforms in Sathi shelters, government homes, institutions and other NGO shelters and to protect children from neglect and abuse.
- Reunite the runaway or separated children with their families and address the causes that led them to run away with an aim to prevent them from repeating the behaviour.
  (Sathi, 13th Annual Report 2010/11)

At a conference on humanitarian logistics held at the University of Hull (UK) in November 2011, Prof Malcolm Harper a long time associate of Sathi presented an overview of the Sathi operation (Harper *et al* 2013). He suggested that it could be

viewed as a ‘supply chain of children’ and asked if anyone in the audience felt that value chain analysis techniques could be helpful in improving the efficiency of the Sathi operation. In response the action research project described in this paper was carried out by the author.

The Sathi process at each of its station projects has a number of key steps:
Platform Outreach: Five or six outreach workers patrol the platforms for up to 12 hours a day, with the task of identifying runaway children, gaining their confidence and trying to persuade them to go to a Sathi shelter.
Shelter : Modest accommodation perhaps comprising one or two rooms in a building close to the railway station. Children are brought to the shelter, provided with food and if necessary, clothing and medical attention. They typically stay for 3 to 4 days and are ‘counselled’ to understand why they have left home and to determine whether it is appropriate to return them to home or to an alternative such as a government children's home .
Address Tracing: In order to return children home it is necessary to know the child’s address or contact details for the parents. Some children know this, in which case the process is relative straightforward providing the child is willing to disclose the information. However many children do not know their address or even the name of their village or area, they have no formal identity document and may be illiterate. In such situations the address tracing process is much more difficult involving contact with and cooperation from police and other agencies across India.
Home Repatriation: Once parents have been traced they are contacted and arrangements made for them to come to the shelter to the collect the child. In some cases this can involve journeys of hundreds if not thousands of kilometres. Parents many of whom are from very poor circumstances receive some counselling and advice at the time of collection to help avoid the child absconding again. In cases where parents are unable to collect the child, a member of Sathi staff takes the child home.
Post-Repatriation Follow up: Where ever possible, Sathi staff periodically contact parents and children to establish if they have settled at home and if necessary give further advice to both parents and children.

Sathi is entirely dependant on charitable funding and receives support from a variety of donors both in India and abroad. In the year 2010-11 Sathi rescued 7341 children from the platforms of 12 stations. Of these70% were repatriated to their homes, 28% were referred to government or other children’s homes and 2% ‘escaped’ from the process. Less than 5% of the children rescued are girls, partly because less girls runaway from home, but also because girls are more vulnerable to organised gangs which patrol the trains and stations to seize girls for trafficking into prostitution and other activities.

The methodological context: Value Chain Analysis and Action Research
Value chain analysis (VCA) is an approach that has been developed over the past decade or so for the improvement of business processes. Value chain analysis is predicated on ‘Lean Principles’ (Womack and Jones, 1996) and most VCA project will incorporate various aspects of lean management such as waste analysis, standardisation of operations, capacity balancing to name but a few (Bichino *et al* 2008). Although first developed and applied in manufacturing industry, VCA approaches are now increasingly used in many other commercial sectors such as

retailing and agriculture, as well as in non-commercial sectors including healthcare, government and humanitarian aid. (For examples see Taylor D.H.: 2011, 2009 and 2005). Value chain analysis provides a systematic approach to process improvement involving the following basic steps:

- identifying all the steps from the start to the end of the process
- developing quantified measures to evaluate the efficiency and effectiveness of the individual steps within the process and of the process as a whole
- identifying 'waste' and 'non-value adding' elements within the process
- developing a prioritised action plan to improve the process

In the business world, VCA has been widely used to improve whole supply chains: for example agri-food supply chains stretching from farm production, through food processing and retailing to delivery to the consumer. In non-commercial environments VCA techniques have been adapted to map and improve 'people' processes, for example in healthcare, patient flows have been tracked from occurrence of illness, through local doctors, hospitalisation and post-operative care.(Jones & Mitchell , 2006). In each of these environments it has been found that the basic VCA methodology is applicable, although it typically has to be adapted to the particular circumstances of the sector being studied. When VCA is introduced into a new sector, the characteristic approach has been to carry out pilot projects with specific organisations to apply, test, adapt and evaluate the methodology. Following this experimental, 'proof of concept' work the methodology and benefits of VCA are disseminated across the sector spurring further applications and uptake. (For example see The Food Chain Centre, 2014)

An action research approach (Checkland P., 1991) was used in the project with the aim of achieving practical improvements in the efficiency and effectiveness of Sathi's child repatriation processes and thereby rescuing more children within the context of the charity's limited financial resources. The methodology employed was essentially the same as that used when applying VCA within commercial organisations. The project was led by the author but directly involved Sathi staff in each step of the process with the aim of transferring knowledge of the method and encouraging ownership of results and recommendations. Prior to this project, management and staff at Sathi had no experience of VCA or lean approaches. The fieldwork was carried out over a period of two weeks in India. The first week was spent analysing the rescue operation at the Pune railway station. The second week was spent in Bangalore working with Sathi's head office staff and senior management and also spending time with the staff involved in the rescue operation at Bangalore station. Subsequent to the fieldwork, a report was produced and circulated to Sathi senior management and other staff who had been involved in the project.

Aims and Objectives

As far as is known, this work with Sathi was the first time VCA has been used in the context of a socially oriented organisation focused on child rescue and repatriation. The aim of the research was therefore to evaluate whether VCA could be beneficially applied in such a context. As an action research project, the project also had a number of practical objectives:

- To gain a structured and detailed understanding of the child repatriation process in terms of both the physical processes through which the child passes and the supporting information systems

- To quantify the performance of a selected Sathi pilot 'value chain'
- To identify key issues and challenges within the selected value chain
- To identify opportunities to improve the efficiency and effectiveness of the process.
- To make recommendations to Sathi management in terms of necessary actions to achieve improvements to the pilot value chain and more generally across Sathi operations throughout India.

The Sathi Value Chain Analysis Case Study

The VCA approach is based around the development of a series of visual, easy to understand 'maps,' which are developed using paper and pencil. (Jones and Womack, 2002). There is no requirement for specialist or complex computer programs, which is helpful in an environment such as Sathi which has low budgets and limited access to information technology. The techniques are intuitive and can be easily understood by staff at all levels within an organisation. Visual presentation of findings and recommendations provides a succinct and effective means of communicating which is particularly helpfully in multi-lingual environments such as Sathi.

The starting point was the production of a 'Big Picture Map' (Figure 1) summarising the main facilities and organisations involved in Sathi's operations across India. VCA focuses on the analysis of specific value chains in order to build up a detailed picture of how processes actually operate. Sathi operates projects at railway stations in 12 cities and, at the broadest level, these can be regarded as 12 separate value streams. The Sathi project in Pune was selected for the pilot VCA study, primarily because the project manager Manoj Kumar was an excellent English speaker and was also deemed to be one of the most progressive managers in the organisation.

At each station where rescue operations take place, two sub-value chains exist. The first relates to what Sathi refer to as 'fresh children and the second to 'old' children. Fresh children are those that have recently arrived on the platform and are rescued, taken to the Sathi shelter and hopefully repatriated to home within a few days. Old children are those who have been living on the platform for weeks or months and have become entrenched in platform life. Such children represent a greater challenge and, if they can be persuaded to participate, are taken to a one-month residential camp during which they are re-orientated and counselled towards the benefits of returning to home. The 'fresh child' process was selected as the focus for detailed analysis in the pilot project, as this represents the most important element of Sathi's work in terms of the number of children rescued. Analysis of the process was carried out over a one-week period in conjunction with Sathi staff in Pune. The results of this situation analysis are presented in the '*Current State Map'* (Figure 2). [1]

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[1] *Note: the big picture and current state maps are shown in the appendices. It should be noted that these maps are specifically designed to be produced and viewed on A3 sized paper, reproduction at smaller size for this publication, makes the detail difficult to discern, however they have been included to show the structure of the approach and associative details will be highlighted in the following sections. The maps can easily be enlarged on a photocopier or powerpoint versions supplied on request from the author*

Current state maps are produced to a standard format which splits the map into three sections:

- The bottom half of the map shows the physical processes through which children flow and includes key performance indicators (KPI's) for each step in the process.
- The top half the map shows the information processes associated with the repatriation process together with Sathi's internal and external reporting procedures.
- The boxes to the right hand side of the map show top-level summary KPI's for the process as a whole.

The objectives of the current state map are threefold:

- To provide a comprehensive and structured description of all the steps and procedures involved in the process.
- To provide a quantified assessment of process performance
- The third and crucial objective of the current state map is to raise questions in the minds of management and staff as to the efficiency and effectiveness of the process.

Some of the Questions Arising from the Pune Current State Analysis

Are the selected Key Performance Indicators appropriate?
When evaluating commercial manufacturing and supply chain processes the relevant KPI's are well established, but many of these are inappropriate in the context of child repatriation. An important part of the project therefore was to start to develop a relevant set of process measures. Key performance indicators were developed in relation to five main issues: process effectiveness, staff effectiveness, cost effectiveness, child retention and process time. Data to populate the KPI's was based on a sample of one month's activity at Pune in October 2011. A fundamental question arises as to whether the selected indicators are the most appropriate KPI's for each element in the process and for the process as a whole? It will only be through further use and consideration of the KPI's by Sathi staff that an agreed and relevant set of measures will emerge.

What is the demand?
A starting point for any VCA project is to understand the demand that the process is required to meet. In this case, demand equates to supply, in that the demand for Sathi's service is determined by the supply of children, i.e. the number of children arriving on the station platform. This varies from day to day and week to week and is impossible to measure with accuracy. However once or twice a year Sathi undertake an intensive 'platform sweep', during which up to 20 staff and volunteers carry out 24-hour surveillance of the platforms over three days to monitor the number of arrivals. The indication at Pune was that on average six children arrive per day. Understanding demand is critical to the design and operation of the whole process. It is the touchstone in determining the level of resources required at each part of the process and the effectiveness of the process in meeting the demand.

What can be done to increase rescue effectiveness?
Analysis of Sathi's rescue activity over a one-month period showed that although an estimated six children per day arrive in Pune, on average only a third of these were

rescued to the Sathi shelter. How can this be increased? What is the optimum number of rescue staff to have on the station? What is the most effective time to have staff on the station? What can be done to help individual staff to improve their rescue rates?

Is the shelter operating effectively?
The Pune shelter has a specified capacity to sleep 15 children per night. What can be done to increase the shelter occupancy from its current average of 7 per night? Fifty five percent of children spent three days or less in the shelter. What are the main reasons why some children remain longer in the shelter? Can anything be done to reduce the length of time children spent in the shelter without compromising the effectiveness of their time with the Sathi? On occasions when the number of children rescued exceeds the sleeping capacity of the shelter, could arrangements be made for excess children to be lodged in other children's homes, rather than straining resources and effectiveness within the Sathi shelter?

How Should Counselling Be Monitored?
A critical activity in the shelter is counselling, the aim of which is to understand the issues which have caused the child to abscond and determine whether or not it is appropriate to return the child to home or to an alternative place of safety. How should counselling-effectiveness be measured? This is a difficult issue particularly when dealing with children who are vulnerable, probably frightened, uneducated and suspicious of anyone offering help. Nevertheless, as counselling constitutes an important element in the process, attempts need to be made to develop a way to evaluate counselling effectiveness. On the current state map some possible approaches to measuring counselling are suggested, but it is acknowledged that these are very much a starting point and need to be refined in conjunction with counsellors and Sathi management.

Documentation.
The upper section of the current state map shows a proliferation of information gathering and processing much which was initially hand-written and later input to computers and the Sathi IT system. Is it possible to streamline and simplify form filling and avoid duplication? Would it be more cost-effective to deploy more computers in order to reduce the amount of staff time involved in form filling? What opportunities are there to streamline, simplify and standardise the reporting process from the shelter to Sathi headquarters?

The above are just some of the issues that arose from the mapping process and these may or may not be the most appropriate questions. The point however, is that by undertaking systematic value chain analysis such questions emerge. The next step was for the management and staff of Sathi to evaluate these issues and develop a prioritised action plan aimed at systematically improving efficiency and effectiveness.

Waste analysis
An important aspect of the lean approach to process improvement is the focus on waste or non-value adding activities. Toyota, the architects of lean management, recognise that waste is inherent in most manufacturing and supply chain systems and that it's elimination or reduction could lead to significant improvements in process efficiency (Liker,2004). In commercial environments Toyota's Seven Wastes (Figure 3) are now well understood.

As part of the value chain analysis project the seven wastes were explained to Sathi's staff responsible for operations in the shelter and on the station. As a team the staff were asked to undertake a structured exercise to consider if and how these wastes were manifest in the child repatriation process. Subsequently staff produced a nine page document identifying wastes within the organisation, some examples of which are as follows:

Unnecessary Transport: In commercial operations this relates to unnecessary movement of the product. In Sathi it was related to unnecessary movement of the child. Examples included: bringing children to the shelter who did not need help; taking children to the police and/or child welfare authorities for registration purposes before taking them to the Sathi shelter.

Unnecessary motion: Refers to the unnecessary movement of staff. Examples include: staff roaming the stations without prior knowledge of the train arrival times; staff having excessive travel time to internal meetings in different buildings, only to find meetings cancelled.

Defects. Examples include failure to inform parents of the documents required for child collection; errors in internal documentation leading to inappropriate decisions or requirements for re-work; inadequate public information on Sathi operations resulting in confrontations for Sathi rescue staff with police, station authorities or the public.

Overproduction: In a commercial context this means producing goods or services in excess of customer demand. Examples in Sathi include: keeping children in the shelter for longer than actually required; completing too many documents and forms for each child with significant duplication.

Waiting: A child may have to wait between each step in the process, for example waiting on the platform before being taken to the shelter; waiting to see a counsellor; waiting for the address tracing procedure to be completed.

The waste analysis exercise complemented the value chain current state map by allowing staff to highlight many of the detailed operational issues and challenges they faced in their day-to-day work. It was also a good mechanism with which to involve operational staff in a VCA project and to encourage staff to think about what they could do to reduce waste and improve aspects of the process in which they had a direct input.

The Potential Benefits of Value Chain Analysis

As a result of the project it is suggested that VCA has a number of possible benefits potential benefit not only to Sathi, but also to its major financial supporters/donors

Benefits to Sathi

A framework for monitoring and evaluation

The project has demonstrated that VCA can provide the basis for systematic and quantified analysis of a child repatriation process. Perhaps the most important aspects of VCA is the development of appropriate key performance indicators both for the individual elements of the process and for the process as a whole. The case study makes a first attempt to develop such a set of measures. However these may not be the most appropriate KPI's and it is anticipated that if VCA is applied more widely within Sathi or other similar organisations a more refined set of metrics would in due course emerge.

A starting point for Operational Improvement:
VCA could be used to evaluate and improve the operations at each step in the rescue process and in the process as a whole. The majority of the staff working within Sathi (and indeed within many such organisations) have a focus on the social needs of the children. They may be qualified in some aspect of social work or counselling but are unlikely to have any experience or knowledge of process management. In consequence processes within the organisation are developed on the basis of common sense and with best intentions but often end up less efficient than they might be. VCA provides a relatively straightforward approach to evaluating processes that could be adopted by operational staff. However current state mapping as described in this paper is just the starting point for value chain improvement. From this should be developed a 'Future State Map' envisioning improvements to the process backed by an action plan to achieve those improvement within a clear timeframe.
A basis for Strategic Comparison
If VCA was carried out at all of Sathi's 12 station projects the 'Whole Chain Summary KPI's' shown on the current state map (Figure 2) would provide a concise mechanism for headquarters management to monitor and compare operations across India. Moreover it would identify areas of both good practice and poor performance within the organisation, and would facilitate a systematic exchange of ideas and approaches between projects.

Benefits To Donors
The development of a succinct and systematic method of monitoring performance and demonstrating improvements to the process through the use of top-level KPI's could be of significant interest to donors and supporters of Sathi. VCA should lead to value chain improvement, with key performance indicators periodically monitored and published. Systematic application of value chain analysis and improvement techniques would enable Sathi to demonstrate to donors continued improvements in efficiency and effectiveness which would help to secure further funding.

A further potential application would be for donor organisations that provide charitable funds, to use the VCA framework, and particularly the most pertinent top-level summary KPI's, as part of their reporting requirements from recipient organisations. Recipients could be required to demonstrate year-on-year improvement in the performance indicators. In commercial organisations performance improvement is driven by market competition and customer choice. Typically in charitable situations, beneficiaries (the customer) have no real voice or leverage. The charities themselves represent the voice of the customer and no doubt do their best to meet beneficiary needs. However it would surely be beneficial for external donors, who have the leverage of providing financial resources to also represent the customer by requiring delivery organisations to ensure they are providing the most effective and efficient service with the funds available.

Conclusion.
This project has demonstrated that value chain analysis techniques developed in commercial environments can be applied be socially orientated process such as the Sathi child rescue operation in India. It was anticipated from the outset that the details of the approach would need to be adapted to the circumstances of the rescue process. This was particularly evident in terms of the need to develop appropriate measures for

the individual steps in the rescue process as well as in the development of top-level KPI's to summarise the performance of the whole process. It is acknowledged that the performance indicators included on the current state map are very much a first draft and that these will need to be refined by Sathi staff if they are to become relevant and meaningful basis for monitoring and evaluating.

Another essential aspect of value chain analysis is the requirement to observe, first-hand, all the steps involved in the process. In this instance the VCA team followed a number of children from point of rescued to point of reuniting with parents. Systematic and detailed observation combined with quantification of process performance almost always reveals many issues and opportunities for process improvement.

However current state mapping and problem analysis as described in this paper are just the starting point for value chain improvement. From this should be developed a Future State Map setting out improvements to the process and quantified targets backed by an action plan to achieve those improvements within a clear timeframe. In most organisations, be they commercial or social, the analysis of value chains, identification of problems and development of recommendations is a relatively easy and straightforward process. The real challenge to achieving improvement is in orchestrating change management. There is usually a need to change both organisational culture and the perceptions and understanding of individual managers and staff.

Sathi is a child centred organisation. Staff are typically drawn from a social work background and a few, if any have any experience or understanding of process-orientated thinking. A vital issue in moving from value chain analysis to value chain improvement is therefore the development of clear strategies to achieve change management in order to achieve acceptance and adoption of the techniques as a useful an integral part of Sathi culture. A critical requirement was for Sathi senior management to understand more of the rationale of VCA and its potential benefits in order to become committed to facilitating its implementation. It was recognised that this was unlikely to occur on the basis of a two-week exploratory project. It was therefore recommended that Manoj Kumar, the project manager at Pune who had participated directly in the value chain analysis work be nominated as a 'VCA champion.' His first task was to develop a detailed improvement plan for the Pune operation based on the recommendations of the pilot project. This would be implemented over a period of six to nine months, with impact on efficiency and effectiveness monitored by the key performance indicators. Assuming implementation was successful, this would provide real evidence of the benefits of the approach and hopefully act as a springboard for further adoption across the organisation. The VCA champion could then instigate further projects at other Sathi sites combined with VCA/lean training for relevant staff.

Runaway children in context

The issue of railway children and street children is by no means confined to India. No one knows the exact number, but estimates suggest that globally there might be as many as 100 million children surviving on the streets. (http://www.streetchildren.org.uk/). Furthermore the problem is not confined to developing countries. In Britain it is estimated that 100,000 children a year runaway

from home many of whom slip under the radar of social services or other child welfare organisations and are left to fend for themselves on the street. (http://www.railwaychildren.org.uk/europe.asp) Although the efforts of Sathi and many other similar charities will only ever make a minute impact on such numbers, their impact on individual lives is huge. If the application of best practices from business, be that lean, value chain analysis or any other technique, can help to improve the efficiency and effectiveness of these operations, and thereby enable the rescue of more children for every pound or dollar available, then it must surely be worthwhile.

Postscript

Unfortunately the plan to develop VCA within Sathi never came to fruition. The funding for Sathi's work in Pune came to an end four months after the completion of the VCA project. Alternative funding could not be secured and the rescue operation at Pune was forced to close. However, Manoj Kumar, the project manager from Pune moved to Orissa, one of the poorest states in India, and in August 2012 established a children's rescue operation on the station at Bhubaneshwar, the state capital. Unfortunately Sathi had no funds to support this operation so a new charity was established- 'The Society for Children' (http://sochforchildren.blogspot.co.uk/) - funded through donations raised in the UK by the charity 'Friends of the Children of Orissa' (http://www.orissa.org.uk/). Premises for a shelter were rented and a small staff team employed. Since then an average of 30 children per month have been rescued out of an estimated 100 or so that arrive on the station. Data is being collected to measure relevant KPI's drawn from the Pune experience and efforts made to apply some lean tools and techniques with the aim of continuously trying to increasing the number of children rescued within the resources available.

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Figure 1

Sathi India
Big Picture Map
Showing main institutions & facilities involved in the child repatriation process

Objective of this map

- To give a top-level overview of the main facilities and organisations involved in the repatriation process.
- A starting point in identifying and selecting specific value streams for detailed analysis
- At this level each of the 12 Sathi project areas can be regarded as separate value streams

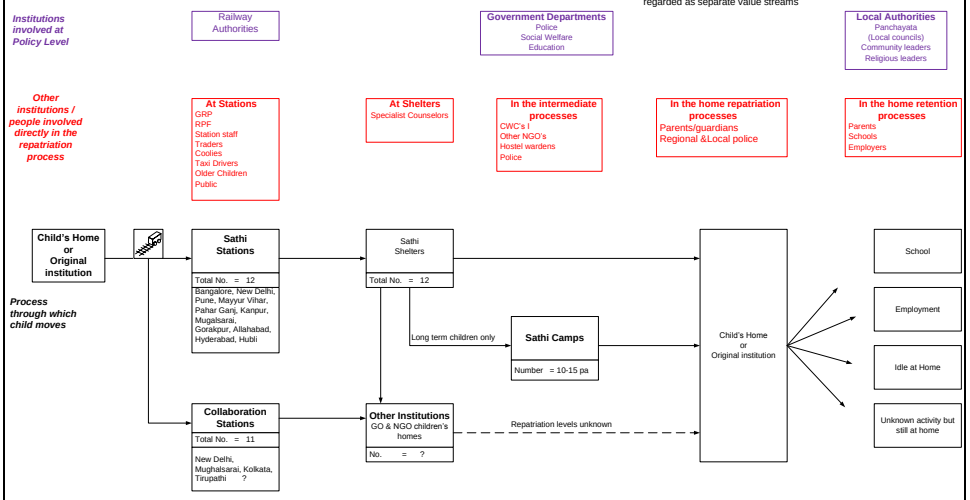

Figure 2

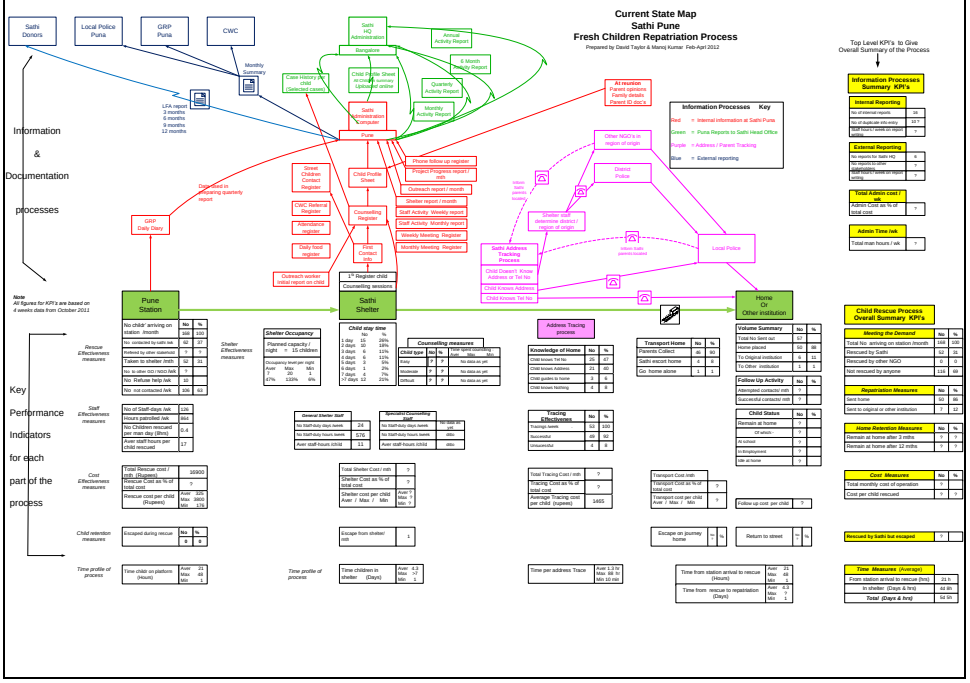

Figure 3

Toyota's Seven Wastes

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